California at Risk

Reducing Earthquake Hazards 1992–1996

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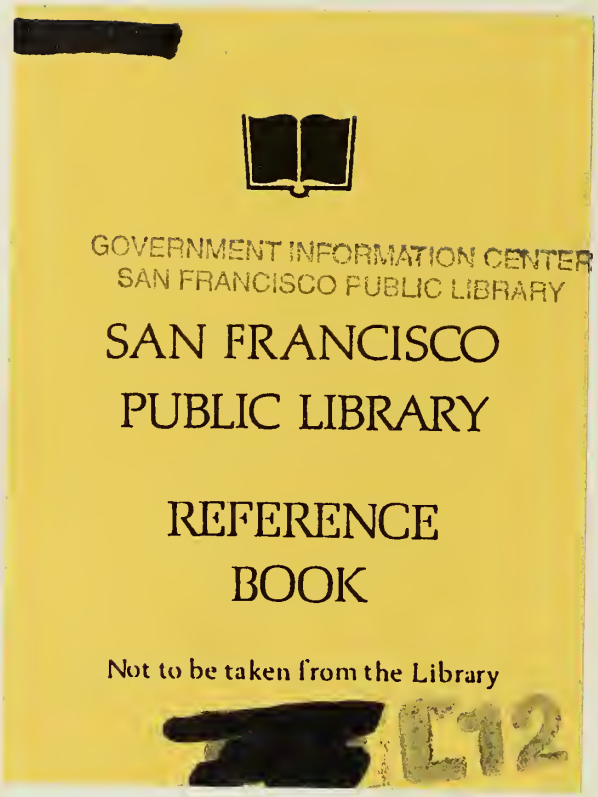

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CALIFORNIA'S
EARTHQUAKE HAZARDS REDUCTION PROGRAM

California at Risk

Reducing Earthquake Hazards 1992-1996

A report of the
California Seismic Safety Commission
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Report No. SSC 91-08
December 31, 1991

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Foreword

With adequate preparation, earthquakes can become manageable disasters: We know approximately where many of our most damaging future earthquakes are likely to strike. We know that they can strike at any moment. We also know much of what needs to be done to reduce damage to acceptable levels. Furthermore we know how to seek the new information needed where we do not already know what to do. In short, we have it within our power to reduce earthquake hazards, minimize risks, and develop plans and resources to manage those risks that cannot be eliminated.

It is clear the cost-effective commitment of resources is essential to effective hazard reduction. Taking steps now to mitigate future earthquake damage, and economic and social disruption, will be much more effective than paying huge sums later to repair facilities and help victims. State and local governments and the private sector have an obligation to deal with our earthquake threat expeditiously. Planning, developing emergency response capability, and retrofitting existing buildings and other structures will help reduce the cost of future earthquakes. There is a strong expectation that major earthquakes will strike one or both of our major urban areas within the next decade or so. Investment in seismic safety during remodeling or new construction will greatly reduce damage and forestall costly rebuilding afterward.

It is a government's primary duty to assure public safety. No California jurisdiction would ignore a major toxic spill threat, a big fire hazard, or any other such "clear and present danger." While the dangers posed by earthquakes are clear, many of the responsible government officials do not see them as clearly present and immediately threatening. Thus it is essential to emphasize the earthquake danger to public safety and economic stability. This ever-present hazard can be reduced and emergency response strengthened.

California's cities and its millions of citizens are now at great risk. The five-year program presented here will help deal with earthquake risk in a cost-effective manner.

Barbara Riordan
Chairman
Seismic Safety Commission

L. Thomas Tobin
Executive Director
Seismic Safety Commission

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Executive Summary

California is earthquake country. Damaging earthquakes can occur almost anywhere in the state. Studies on a few of the larger and better known faults conclude that major earthquakes are likely at any time within a few decades. Many other active faults are much less well understood, and still others remain undiscovered. Damaging earthquakes can occur on any of these faults, although the location and timing cannot be predicted with precision.

The probability of damaging earthquakes is high. A group of our most knowledgeable scientists has estimated that the chance of a major earthquake striking southern California within the next 30 years is 60 percent, while in the Bay Area it is 67 percent. This means there is over a 90 percent chance that at least one major earthquake (over magnitude 7.0) will strike an urban area in California within the next decade or so. As in the past, we can count on smaller but still damaging earthquakes to strike about every two years.

Much of what needs to be done to reduce earthquake hazards and manage risk is already understood and simply needs to be put into effect. We also have a good grasp of the kinds of further research and new knowledge that would most help in promoting earthquake safety. With diligent effort and a commitment of resources, California can be made reasonably secure against earthquake damage and disruption.

This should remain a high-priority goal for the state government, which has a primary duty to assure public safety. California's cities and residents will remain at risk until the serious earthquake threat is reduced by public and private-sector action. Recognizing this continuing threat, the California Earthquake Hazards Reduction Act of 1986 calls for a significant reduction of earthquake hazards by the year 2000.

California at Risk compiles California's five-year program of earthquake hazard reduction, aimed at meeting the year-2000 goal. It sets forth priorities, project schedules, funding sources, amounts, and activities (termed "initiatives"). Appendix A describes California's current program of hazard reduction, emergency response, and disaster recovery. Progress under the first five-year program, adopted in 1986, is documented in Appendix B.

The second five-year program, contained herein, reflects progress made and insights gained in the first five years. Post-earthquake observations and research after Whittier Narrows (1987) and Loma Prieta (1989) have also provided guidance for the Seismic Safety Commission and the other 43 state agencies that have responsibility to help carry out the program to reduce earthquake hazards.

The 42 initiatives in this latest *California at Risk* outline a comprehensive hazard reduction program that will significantly improve the state's ability to withstand earthquakes (Table 1). Some 150 program milestones are provided to measure progress, record accomplishments, and help keep the program on schedule. The initiatives complement present programs carried out by state and local governments, schools, private-sector enterprises, and volunteer agencies. They provide policymakers a way of assessing the rate of progress toward the ultimate goal. The action plans, tables V through IX, enumerate activities and milestones for each calendar year of the program, and identify responsible organizations.

These initiatives, integrating action by both the public sector and the private sector, are organized into five categories:

- *Category 1*: 19 initiatives that encourage hazard reduction in existing vulnerable facilities.
- *Category 2*: 5 initiatives that encourage hazard reduction in new facilities.
- *Category 3*: 9 initiatives to encourage improvements in emergency management.

- *Category 4*: 5 initiatives to expedite the disaster recovery process.
- *Category 5*: 3 initiatives to assist research and education.

California at Risk is an ambitious agenda requiring the cooperation and participation of diverse organizations and agencies. Progress on a number of initiatives will require action by both the Governor and the Legislature to establish policy assigning new responsibilities, granting new authority, and appropriating additional fiscal resources. For its part, the Commission will continue to participate in and monitor this program through public hearings, reports, and workshops. It will function as a facilitator to integrate activities, coordinate individual actions, and assist the primarily responsible agencies in every possible way.

In 1997, at the end of this five-year program, we will be very close to the year 2000 deadline for significantly reducing earthquake-related hazards that has been set by the Legislature and the Governor. If we are to reach our goal, all players must understand not only the specifics of individual initiatives, but the general scheme into which they fit. To aid in both, this summary includes a list of the initiatives with a summary of each followed by a table showing the lead agency for each initiative and the year it is scheduled to start.

Summary of Initiatives

Category 1: Existing Vulnerable Facilities

1.1—Establish Seismic Evaluation and Retrofit Building Standards. The greatest stumbling block to retrofit efforts is the lack of standards for existing buildings. This initiative will focus on greater state involvement in standards development.

1.2—Improve Safety of Older Hospital Buildings. An initiative in the first five year program focused on identifying the scope of the earthquake hazards in existing hospital buildings. This second five year program will create a seismic hazard mitigation program for these buildings.

1.3—Improve Safety of Older Public School Buildings. While public school buildings constructed under the Field Act have performed well in past earthquakes, earlier building code standards permitted construction of certain types of potentially hazardous buildings, especially nonductile concrete buildings. A statewide hazard identification and reduction effort is needed for the small but significant percentage of such potentially hazardous, public school buildings.

1.4—Develop Falling Hazard Guidelines for State Buildings. The state can greatly reduce the damaging effects of moderate ground shaking by reducing hazards of falling objects through building maintenance policies.

1.5—Improve Safety of State-Owned Buildings. This initiative builds on the first five years of effort that obtained a $250 million funding source for seismic hazard reduction projects, and sets a goal for achieving acceptable levels of earthquake risk in state buildings by the year 2000.

1.6—Improve Essential Services Buildings. A 1986 law requires new essential services buildings to be constructed to withstand earthquakes without a loss of operations. This initiative focuses on reducing seismic hazards in essential services buildings built before 1986.

1.7—Improve Safety of Older High-Occupancy Buildings. In future earthquakes hundreds of lives could be lost in the collapse of just one nonductile concrete building containing a large number of people. This initiative focuses on the most suspect buildings with the highest potential for loss of life and injury.

1.8—Improve Safety of Homes. Information about typical earthquake hazards in homes should be disclosed on their sale.

1.9—Improve Safety of Mobile Homes. Retrofit programs are proposed to address the known earthquake vulnerabilities of mobile homes.

1.10—Preserve Historic Buildings. Unless seismic resistance of the most important

and vulnerable historic buildings is addressed, California stands to lose irreplaceable parts of its cultural heritage.

1.11—Reduce Workplace Hazards. Cal/OSHA is responsible for enforcing minimum workplace safety requirements. This initiative will clarify that their responsibility includes earthquake safety.

1.12—Review Safety of Federal Dams. The state should assure that design practice for all federal dams in California provides an acceptable level of risk that is comparable to the state's practice.

1.13, 1.14, 1.15—Improve Earthquake Performance of Power and Gas, Water, and Sanitation Systems. These initiatives propose to develop comprehensive policies on acceptable levels of earthquake risk for these key lifelines.

1.16—Improve Earthquake Performance of Transportation Structures. Hundreds of older highway and railroad bridges are in need of seismic retrofit.

1.17—Improve Earthquake Performance of Offshore Oil Facilities. Extending the service life of existing offshore hydrocarbon production facilities in state and federal waters requires development of a standard procedure and guidelines to requalify such production facilities.

1.18—Improve Performance of Transportation Systems and Infrastructure. Commerce depends on a number of transportation systems including ports, airports, railroads, pipelines and producers. Acceptable earthquake performance of these systems should be determined.

1.19—Clarify Liability Concerns of Seismic Hazard Mitigation. Tort liability issues for building owners and design professionals should be addressed.

1.20—Develop Legal Recommendations for Seismic Hazard Mitigation. Guidelines are needed to assure that hazard reduction efforts are promoted without improperly infringing on owners' rights.

Category 2: New Facilities

2.1—Improve Seismic Standards for New Construction. The state should actively encourage the improvement of seismic standards for new construction.

2.2—Map Geologic Hazards. Rapid implementation of the state's new seismic hazards mapping program is crucial to improved seismic safety.

2.3—Establish Independent Seismic Design Review Policies. The Commission should encourage the use of independent seismic design reviews as a cost-effective way to improve seismic safety.

2.4—Improve State Agencies' Seismic Design and Construction Practices. The state should protect its investment in buildings and other structures through independent review and greater efficiency, accountability, and flexibility by its construction practices.

2.5—*Improve Design and Construction Seismic Safety Training.* The state should encourage the building professions to take a more active role in continuing education for their members regarding the many developments in seismic safety.

Category 3: Emergency Response Management

3.1—Improve Emergency Communications System. This is the highest emergency response priority. All management actions during an emergency require communications. The Loma Prieta earthquake demonstrated unacceptable weaknesses.

3.2—Improve Emergency Management System. An integrated standard emergency management system needs to be established and used by all levels of government.

3.3—Improve Mutual Aid. The ability of jurisdictions unaffected by an earthquake to provide assistance to damaged jurisdictions needs to be expanded to include all government functions.

3.4—Improve Medical Mutual Aid. Medical mutual aid presents different problems than mutual aid for government services (Initiative 3.3) because of the mix of private and public

3.5—Determine Emergency Medical Care Needs. The Emergency Medical Services Authority should estimate the number of hospital beds needed after a major earthquake so that medical communities can ensure adequate care.

3.6—*Improve Shelter Planning.* Emergency shelters providing interim housing for earthquake victims are now needed for

longer periods and require more support services than previously anticipated.

3.7—Improve Professional Qualifications of Emergency Managers. As management systems become more complex, emergency managers must receive additional training.

3.8—Reduce the Risk of Hazardous Materials Release in Earthquakes. The potential for earthquake-caused releases of hazardous materials requires that owners and regulators consider earthquake hazards in the manufacture, transportation, storage, use, and disposal of such

3.9—Improve Earthquake Performance of Telephone Systems. The flood of telephone calls immediately after earthquakes requires improvement of the telephone system's ability to withstand earthquake forces and to maintain essential communication capabilities.

Category 4: Disaster Recovery

4.1—Implement Recovery Guidelines. Cities and counties need to plan ahead to expedite and shape community earthquake recovery.

4.2—Initiate a State Recovery Plan. Individual state agencies need to assure that they can deliver or restore necessary services promptly after an earthquake.

4.3—Estimate Economic and Governmental Impacts. A study of the effects of a major urban earthquake on the state's economy and government functions is needed to guide the future allocation of state resources.

4.4—Develop Rubble Disposal Strategy. Dumping rubble into the bay or ocean, as was done after the 1906 San Francisco earthquake, is no longer acceptable. Alternatives must be

4.5—Provide Post-Earthquake Housing. Finding interim and long-term housing for low-income earthquake victims involves different government agencies from those involved in emergency shelters. A plan is needed to reduce future losses and rapidly replace damaged buildings.

Category 5: Research and Information/Education

5.1—Implement an Earthquake Research Plan. Research investigations that will do the most to reduce California's earthquake hazards should be identified, funded, carried out, and the results disseminated to users.

5.2—Establish a Coordinated Earthquake Information Strategy. A plan should be developed to deliver appropriate earthquake information to all segments of the public.

5.3—Identify and Reduce Tsunami Hazards. State and federal agencies will assess the risk of tsunamis—earthquake-triggered ocean waves that can devastate coastal areas—and propose an appropriate hazard reduction program.

Table I—The Initiatives

No.	*Title*	*Lead Agency*	*Scheduled Start*
Category 1—Existing Vulnerable Facilities			
1.1	Establish Seismic Evaluation and Retrofit Building Standards	SSC	1991
1.2	Improve Safety of Older Hospital Buildings	OSHPD	1992
1.3	Improve Safety of Older Public School Buildings	OSA	1991
1.4	Develop Falling Hazard Guidelines for State Buildings	BSC	1991
1.5	Improve Safety of State-Owned Buildings	OSA	1991
1.6	Improve Essential Services Buildings	OSA	1992
1.7	Improve Safety of Older High-Occupancy Buildings	SSC	1991
1.8	Improve Safety of Homes	HCD	1991
1.9	Improve Safety of Mobile Houses	SSC	1991
1.10	Conserve Historic Buildings	SHBSB	1992
1.11	Reduce Workplace Hazards	Cal/OSHA	1992
1.12	Review Safety of Federal Dams	DWR	1992
1.13	Improve Earthquake Performance of Power and Gas Systems	PUC	1991
1.14	Improve Earthquake Performance of Water Systems	DWR	1992
1.15	Improve Earthquake Performance of Sanitation Systems	DWR	1992
1.16	Improve Earthquake Performance of Transportation Structures	Caltrans	1991
1.17	Improve Earthquake Performance of Offshore Oil Facilities	SLC	1992
1.18	Improve Performance of Transportation & Infrastructure	SSC	1992
1.19	Clarify Seismic Hazard Mitigation Liability Issues	SSC	1992
1.20	Develop Suggested Civil Procedures for Seismic Hazard Mitigat.	SSC	1992
Category 2—New Facilities			
2.1	Improve Seismic Standards for New Construction	BSC	1992
2.2	Map Geologic Hazards	DMG	1991
2.3	Establish Independent Seismic Design Review Policies	SSC	1992
2.4	Improve State Agencies' Seismic Design & Construction Practic.	SSC	1992
2.5	Improve Seismic Safety Training of Professionals	SSC	1992
Category 3—Emergency Response Management			
3.1	Improve Emergency Communications System	OES	1991
3.2	Improve Emergency Management System	OES	1992
3.3	Improve Mutual Aid	OES	1992
3.4	Improve Medical Mutual Aid	OES	1992
3.5	Determine Emergency Medical Care Needs	EMSA	1992
3.6	Improve Shelter Planning	DSS	1992
3.7	Improve Professional Qualifications of Emergency Managers	OES	1992
3.8	Reduce the Risk of Hazardous Materials Release in Earthquakes	OES	1992
3.9	Improve Earthquake Performance of Telephone Systems	PUC	1992
Category 4—Disaster Recovery			
4.1	Implement Recovery Guidelines	SSC	1992
4.2	Initiate a State Recovery Plan	SSC	1992
4.3	Estimate Economic & Governmental Impacts	SSC	1991
4.4	Develop Rubble Disposal Strategy	BCDC	1992
4.5	Provide Post-Earthquake Housing	HCD	1992
Category 5—Research and Information/Education			
5.1	Implement an Earthquake Research Plan	SSC	1991
5.2	Establish a Coordinated Earthquake Information Strategy	SSC	1992
5.3	Identify and Reduce Tsunami Hazards	SSC	1993

Key to Table I:

BCDC	San Francisco Bay Conservation and Development Commission
BSC	Building Standards Commission
Cal/OSHA	California Occupational Safety and Health Administration
Caltrans	Department of Transportation
DMG	Department of Conservation, Division of Mines and Geology
DSS	Department of Social Services
DWR	Department of Water Resources
EMSA	Emergency Medical Services Authority
HCD	Department of Housing and Community Development
OES	Governor's Office of Emergency Services
OSA	Office of State Architect
OSHPD	Office of Statewide Health Planning and Development
PUC	Public Utilities Commission
SHBSB	State Historical Building Safety Board
SSC	Seismic Safety Commission

Introduction

Earthquakes are an inevitable part of California's future: A future that we can shape through consistent effort to reduce hazards, improve our ability to respond in emergencies, and plan to recover from the damage. This report sets forth a strategic program of new initiatives that will help all Californians become better prepared for earthquakes.

This report presents the program required by the California Earthquake Hazards Reduction Act of 1986 (Government Code Section 8870 *et seq.)*. The act directs the Seismic Safety Commission to establish a series of five-year programs to reduce statewide earthquake hazards significantly by the year 2000. The first program, adopted in 1986, led to significant progress and became the state's official earthquake hazard mitigation program.

This second five-year program reflects progress in the first five years, and builds on lessons learned. It uses new information and insights from the Whittier Narrows earthquake (1987) and the Loma Prieta earthquake (1989). It incorporates the results of continuing research. It continues to give the guidance for the state's priority-driven, comprehensive, and integrated program to reduce earthquake hazards. When the activities proposed in this second program are well underway, California will have a complete and comprehensive hazard reduction program. The state's ability to withstand the inevitable earthquake will be significantly improved.

The 42 initiatives in this second program (Table I) describe the new actions that must be undertaken, most of them by state government. However, the program depends not only on these new actions but on continuing the scores of existing activities being carried out by various state agencies, local governments, schools, businesses, volunteer and private nonprofit agencies, and individuals. Responsibilities for implementing the state-government portion of the program are shared by 50 state agencies; continued progress depends as much on how they carry out their existing activities, described in Appendix A, as it does on how they deal with the new tasks described in this report.

In 1997, at the end of this five-year program, we will be very close to the year 2000 deadline set by the Legislature and the Governor. We are competing against time.

Loma Prieta Earthquake

The moderate Loma Prieta earthquake that struck the rural Santa Cruz mountains on October 17, 1989, was a reminder of the past and a glimpse of the future. It demonstrated the great strides in reducing hazards made over the last two decades, but it also highlighted our continuing vulnerability.

Loma Prieta showed once again that some older concrete buildings and many old brick buildings are hazardous. It severely damaged hundreds of unreinforced masonry buildings, which were responsible for several deaths. This moderate earthquake gave us an inkling of the homeless problem large urban areas would face after a major damaging earthquake. Watsonville, near the epicenter, lost up to eight percent of its housing. In an area where housing was already scarce, where rents were already too high for many tenants, and where the economy was less than vibrant, the earthquake was a personal and economic tragedy for many people.

Though the Loma Prieta earthquake was only moderately strong and was located far from urban centers, it caused about $10 billion in damage and indirect losses in the ten affected counties. Table II, "Loma Prieta Earthquake Losses," summarizes the damage. Damage to government facilities, excluding damage to bridges and highways, amounted to almost $2 billion. Nearly two years later, the state and local governments are still trying to find the money to repair these damaged facilities. Tax receipts to federal,

state, and local governments and special districts dropped significantly because of the earthquake; business failures, unemployment, decreased sales and tourism-related taxes, reduced assessments on damaged or destroyed property, and increased casualty loss deductions all played their parts. Economists may argue that California's 1990-92 budget problems would have occurred anyway, and that there were economic troubles all over the country, but at least some of California's current fiscal difficulties appear to stem directly from the earthquake.

Table II
Loma Prieta Earthquake Losses
(Dollars in billions, rounded)

Direct Public Losses	Direct Private Losses	Indirect Losses	Total Losses
$3.9	$5.4	$0.5	$9.8

Lessons from Loma Prieta

Several of the new initiatives in this second *California at Risk* program were suggested, modified, or strengthened based on experiences in the Loma Prieta earthquake:

- *Initiative 1.1, Establish Seismic Evaluation and Retrofit Building Standards.* Lack of appropriate standards caused a significant problem for building departments issuing permits for repair of buildings damaged in the Loma Prieta earthquake. The absence of standards discourages building owners and local governments from adopting hazard reduction measures.
- *Initiative 1.3, Improve Safety of Older Public School Buildings.* The Loma Prieta earthquake prompted the Berkeley Unified School District to evaluate its buildings; several that posed collapse hazards have been
- *Initiative 1.5, Improve Safety of State-Owned Buildings.* State office buildings in San Francisco and Oakland, sixty miles from the epicenter of the Loma Prieta earthquake, were closed due to damage. There are more than 18,000 state-owned buildings throughout California, many of them known to have limited capability to resist seismic forces. The state needs to undertake a retrofit program to ensure they will withstand damaging earthquakes."
- Initiative 1.9, *Improve Safety of Homes.* Because of the concentrations of older homes that lacked proper wall bracing and anchorage, the earthquake greatly increased the problem of homelessness especially in
- *Initiative 1.11, Reduce Workplace Hazards.* While newer structures generally performed well in the earthquake, building contents—furniture, equipment, and stock—often were not secured, causing loss of function, hazards for employees, and significant damage.
- *Initiative 1.16, Improve Earthquake Performance of Transportation Structures.* The collapse of the Cypress viaduct and a portion of the Bay Bridge, and damage to newer structures, illustrated that major efforts are needed to retrofit highway bridges.
- *Initiative 2.2, Map Geologic Hazards.* As the damage in San Francisco's Marina District vividly demonstrated, local soil conditions are an important factor in causing earthquake damage.
- *Initiative 3.1, Improve Emergency Communications System.* Communications are always a problem after an earthquake; new technology offers
- *Initiative 3.6, Improve Shelter Planning.* Urban earthquake victims require shelter services for a longer period than victims of other disasters, and the multicultural populations of our cities require special considerations in managing shelter resources.
- *Initiative 4.1, Implement Recovery Guidelines.* Communities that plan ahead will suffer less from their
- *Initiative 4.2, Initiate a State Recovery Plan.* The state can't fulfill its role in disaster assistance if its own facilities are damaged and its operations in a turmoil.

A Balanced Approach

The probability of damaging earthquakes is high. A group of our most knowledgeable scientists has estimated that the chance of a major earthquake striking southern California within the next 30 years is greater than 60 percent, while in the Bay Area it is

67 percent. This means there is over a 90 percent chance that at least one major earthquake will strike an urban area in California within this time period. And, as in the past, we can count on smaller but still damaging earthquakes to strike about every two years. All of California is at risk.

California has some advantages in dealing with its earthquake risk. Virtually all Californians know of the earthquake threat; our building codes have considered seismic forces for over 50 years; our most common wood-frame house typically resists earthquakes forces well; emergency responders at the local and state government levels generally have good plans and respond well to most emergencies; and many of our businesses have acted to reduce their earthquake risks.

In spite of these advantages, our remaining level of risk is unacceptably high. Older, nonductile concrete and unreinforced masonry buildings still house too many families and businesses. Too many utility and infrastructure systems are vulnerable to unacceptable amounts of damage. The government—and private sector—needs to invest in emergency response equipment, facilities and training.

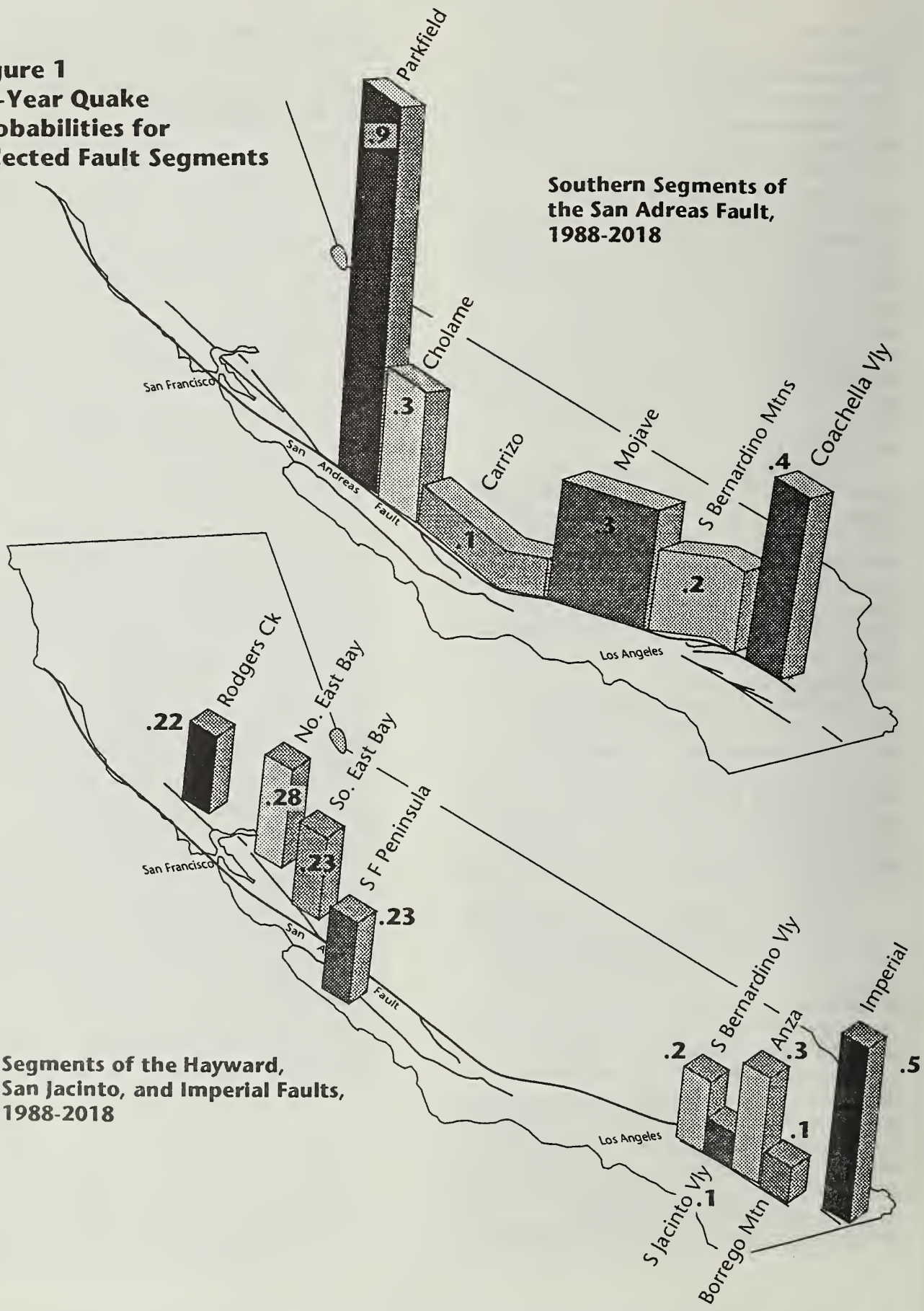
A balanced, long-term approach to earthquake risk management means combining risk reduction through hazard mitigation with plans to manage the remaining risk. For example, the lower-cost seismic retrofit of a building to reduce loss of life, but allows for considerable damage, might be combined with plans for relocating its functions after an earthquake.

Coping with California's earthquake risk requires an approach that balances current social needs with earthquake safety, and expenditures for hazard reduction with investment in programs to manage and respond to the remaining hazards. There will never be earthquake-proof buildings or an earthquake-risk-free society, but we can reduce the risk and manage the remaining risk by continuing our earthquake programs and by putting into practice the initiatives recommended in this program. When seismic considerations become a normal part of every organizations' program development, maintenance activities, and emergency planning, we will be well on our way to managing our earthquake risk.

International Decade for Natural Disaster Reduction

In 1987 the United Nations' General Assembly adopted a resolution declaring the 1990s the International Decade for Natural Disaster Reduction (IDNDR). The concept, proposed in 1984 by Dr. Frank Press, President of the National Academy of Sciences, called for "a decade in which the international community will pay special attention to fostering cooperation in the field of natural disaster reduction." That year, the U.S. Senate and House of Representatives endorsed the IDNDR concept in resolutions, and the U.S. National Committee for the Decade for Natural Disaster Reduction was created to craft a program for the nation. The State of California recognized the potential value of the IDNDR idea in 1988. Governor George Deukmejian issued a proclamation declaring the 1990s as California Decade for Natural Disaster Reduction, encouraging all Californians to participate in appropriate activities. The Commission's five-year program supports the goals of the IDNDR concept. The program integrates scientific and technological advances in natural disaster reduction into California public policy. The Commission's program will further state, national and international goals for the IDNDR, and capitalize on the unprecedented opportunities that the decade will offer. Even though California state agencies must concentrate on hazard reduction efforts in California, they will share the knowledge gained nationally and internationally by this comprehensive program. Along with representatives of other states and nations participating in the IDNDR effort, Californians will continue to pursue learning about hazard mitigation from our damaging earthquakes.

Figure 1
30-Year Quake Probabilities for Selected Fault Segments



Information from *Probabilities of Large Earthquakes Occurring in California on the San Andreas Fault,* Open-File 88–398, U.S. Geological Survey, 1988

The California Earthquake Hazards Reduction Program

The goal of this earthquake hazard reduction program is established in statute: to reduce California's earthquake hazards significantly by the end of the century. In consultation with other agencies, the Commission has set broad objectives to meet this goal and has defined specific initiatives to reach these objectives.

The Commission recognizes that meeting the statutory goal requires all levels of government and the private sector to cooperate in carrying out hazard reduction programs, and to prepare for major earthquakes. While the state is responsible for the health and welfare of its citizens, many of the actions needed for seismic safety are delegated to local governments. But government alone cannot reach the goal without the private sector also investing in earthquake safety, and developing plans and resources restoration of functions after earthquakes.

State government has a special role in reaching the goal set by the California Earthquake Hazard Reduction Program: It owns more buildings than any other organization in the state; is responsible for major elements of the state's infrastructure—highways, bulk water supplies, prisons, and universities; collects money for state and many local activities; is a financial partner with local government in public schools, wastewater treatment facilities, health care and mental health services, social services, and judicial activities; and has the authority to set statewide standards and to enable local governments to create specific programs. The state and its elected leaders can provide an example and valuable leadership that can encourage better earthquake safety practices.

The California Earthquake Hazards Reduction Act

(Government Code Chapter 12, Section 8870 et seq.)

The California Earthquake Hazards Reduction Act was authored by Senators Alquist and Campbell and signed into law by Governor Deukmejian on October 2, 1985. The statute requires the Seismic Safety Commission to prepare and administer a program setting forth priorities, funding sources, amounts, schedules, and other resources needed to reduce statewide earthquake hazards significantly by the year 2000.

California's ongoing efforts are described in Appendix A, The State's Earthquake Programs. Table III, "Seismic Safety Programs," FY 91-92, summarizes the expected expenditures for the year from July 1, 1991, to June 30, 1992. This program focuses on the state's twin responsibilities to maintain its own facilities and programs and to set an example to encourage local governments and the private sector to prepare strategic plans for their own hazard reduction programs. All three—the state, local governments, and the private sector—must work together for these plans to be effective. Relationships must be established that involve almost everything that state and local governments and the private sector do; where day-to-day relationships do not exist now, they may be forged in the aftermath of an earthquake. The initiatives of this program attempt to create the incentives and remove barriers that will allow this to happen.

To set such an example, the state needs to address the problems described in *Competing Against Time,* the report of the Governor's Board of Inquiry on the 1989 Loma Prieta earthquake. It needs to act on the

recommendations for reducing the earthquake threat to the state's own facilities and operations outlined in the Commission's reports *Report to Governor George Deukmejian on Executive Order D-86-90* (SSC 90-06) and *Policy on Acceptable Levels of Earthquake Risk in State Buildings* (SSC 91-01). The recommendations in these reports provide a starting point for the program that the state government must undertake if its own facilities are to survive the inevitable major urban earthquakes.

The Commission believes that each state agency must adopt a policy that establishes seismic safety as a priority in allocating its resources. Moreover, each agency also must implement a seismic safety plan that identifies its earthquake hazards, abates those that pose unacceptable risks, and manage or mitigate those that cannot be removed. This will require a commitment by management, adequate staff and funding, and the means to measure and report progress if we are to complete such a program.

Table III—Seismic Safety Programs FY 91/92

(Dollars in thousands, rounded)

	Seismic Safety Activities			Disaster & Recovery		
Department	**General Funds**	**Revenue Funds**	**Federal Program Funds**	**State Recovery Funds**	**Federal Recovery Funds**	**Total**
Dept. of Conservation	2,452	6,114	50			**8,616**
Office of Emergency Services	3,010		1,450	85,386	102,765	**192,611**
California Energy Commission	190					**190**
Dept. of General Services	220	16,780				**17,000**
Dept. of Insurance		40				**40**
Public Utilities Commission	47	8				**55**
Seismic Safety Commission	795	481	100			**1,376**
Dept. of Water Resources	1,513					**1,513**
University of California	1,929		1,505			**3,434**
EMSA	3,855		1,981			**5,836**
San Francisco BCDC	17					**17**
OSHPD		16,604				**16,604**
Caltrans		2,676		45,933	371,641	**420,250**
CHP				890		**890**
Military Dept.				27		**27**
Total	**14,028**	**42,703**	**5,086**	**132,236**	**474,406**	**668,459**

This five-year program is similar to the 1987-91 program, but has important differences. It includes fewer initiatives—in part because of the accomplishments of the last five years, and in part to focus on the highest-priority initiatives to improve program implementation. Cost estimates in this program are more accurate. After experience with the first program, estimates of the time it will take to carry out the initiatives are more realistic.

This plan was submitted in draft to each of the agencies and organizations mentioned in the initiatives giving them an opportunity to comment on and improve the initiative; public hearings were held on August 8, and September 12, 1991, to allow an opportunity for formal comment.

Priorities

This program and its initiatives recommend the activities that the state needs to concentrate on for the next five years. The initiatives and milestones describe when the activities should be carried out; some, rather than being ends in themselves, provide the basis for still further actions. Many other activities could be included, but the Commission has concluded these are the most important to reach the goal of significantly improving California's earthquake safety by the year 2000.

The Commission applied five criteria to each initiative to set priorities:

1. Lives saved—The potential number of lives to be saved and injuries prevented.
2. Damage reduction—The potential to avoid property and economic losses.
3. Socioeconomic continuity—The potential to reduce social and economic disruption.
4. Opportunity—The relative ease with which the activity can be implemented and the degree to which the activity complements other activities (the opportunity to leverage resources of others through a relatively small investment).
5. Cost—The dollar cost associated with the activity.

Then each initiative had to meet a common-sense test, that is, whether the initiative would be considered by both decision-makers and the general public as being practical, sensible, and feasible. The resulting priorities are reflected in the initiatives included in this program.

The Initiatives

The program involves dozens of state agencies, local agencies, the private sector, and volunteer groups. Thus, while the initiatives described in this section are primarily actions that various state agencies should take to reduce earthquake hazards and improve California's earthquake safety, other sectors of California's communities are regarded as contributors to the program. Many tasks in the initiative milestones require full support and active participation by private groups and organizations to be successful.

Each initiative begins by explaining the public safety issue that justifies use of the state's limited resources to satisfy the objective. Next, the initiatives explain what the actions are intended to accomplish, set a date by which the initiative should be started, and identify the lead agency responsible for implementation. The milestones help focus the efforts of all the participants by describing achievable steps to help measure progress.

The initiative descriptions include cost estimates. For some, the estimates are only "best guesses" because the problems to be addressed by the initiative still require extensive study. In others, the resources needed have been identified and in some cases appear to be within the responsible agency's existing budget capability.

The program includes initiatives in five categories:

1. Addressing the hazards associated with existing vulnerable facilities, including utility and transportation systems as well as buildings.
2. Improving the seismic resistance of new facilities.
3. Improving management of the emergency response and relief efforts.
4. Improving disaster recovery.
5. Supporting research and public information and education

Table I, "The Initiatives," lists each initiative and the year its first milestone is to be started.

Category 1

Existing Vulnerable Facilities

Structural collapse is the most recognized and greatest threat to life safety during an earthquake. Existing buildings, bridges, dams, lifelines, and utility systems, especially those designed and constructed before effective earthquake codes, are the source of most of California's earthquake hazards. This program strongly emphasizes the need to reduce the hazards of these vulnerable structures.

Important strides have been made to improve many of the state's vulnerable facilities; however, much more is still to be done. The task of reducing this threat is not easy, nor will it be inexpensive. Nevertheless, reducing the hazards of existing facilities is critical to meeting the goal of significantly reducing earthquake hazards by the year 2000.

Existing facilities present three kinds of hazards:

- Partial or total collapse of buildings and
- Falling hazards, damage and disruption of nonstructural building elements and contents (parapets, signs, windows, cladding, furnishings, equipment,
- Vulnerable infrastructure (e.g., utilities and transportation facilities)

The following measures will facilitate reducing these hazards:

1. Identify the facilities that are potentially hazardous and subject them to detailed evaluations.
2. Develop analytical methods and seismic retrofit standards to guide professionals and their clients in making reasonable earthquake risk decisions.
3. Disclose hazards and educate and motivate the public, the owners of these facilities, and government to undertake difficult and sometimes disruptive, but worthwhile, hazard reduction activities.
4. Provide financial, legal, or other incentives to encourage and enable owners to invest in seismic retrofit projects.
5. Develop techniques to manage the social and economic impacts of retrofit projects.
6. Focus research efforts on these hazard-reduction needs in these areas.

The general objectives of the California Earthquake Hazards Reduction Program that relate to this category are

- Develop consensus standards for seismic evaluation and retrofit. Many professionals believe that the lack of standards is the most significant barrier to improving seismic safety. Now, when a building is evaluated for seismic retrofitting, design professionals must use their judgment about what to do and how—and, needless to say, professional judgments can differ. Current building codes are essentially focused on construction of new facilities, leaving most jurisdictions at a loss as to what standards should be required for the seismic retrofit of existing ones.
- Carry out programs to identify and retrofit potentially hazardous buildings and structures, both public and private, that need additional evaluation; complete reviews and accelerate retrofits of hazardous buildings, especially state-owned buildings, public schools, essential services buildings, hospitals, and bridges.
- Educate owners about the wide variation of the seismic performance of facilities that are built to various standards.
- Establish hazard mitigation programs in each of the electrical, gas, water, and sewer utility companies.

Initiative 1.1

Establish Seismic Evaluation and Retrofit Building Standards

Hazard mitigation is impeded by the lack of uniform standards for the evaluation and retrofit of seismic hazards. Without standards, governments are reluctant or unable to impose hazard-reduction requirements on; owners and their design professionals lack guidance on what level of risk is appropriate. The variety of methods of evaluation and retrofit are not well explained or understood, often delaying and discouraging owners and government officials from making informed decisions and reducing earthquake hazards.

Objective

By **December 1995**, the Building Standards Commission adopts seismic evaluation and retrofit standards for all buildings.

Milestones

1. By **January 1992**, the Seismic Safety Commission identifies needs and begins to research and develop improved seismic evaluation and retrofit standards.
2. By **December 1992**, the Office of the State Architect and the Buildings Standards Commission, assisted by the Seismic Safety Construction Coordinating Council and the Structural Engineers Association of California, develop and adopt guidelines for seismic repair and retrofit of state government buildings.
3. By **December 1993**, the Structural Engineers Association of California, assisted by the Building Standards Commission, the Office of the State Architect, and the California Building Officials, develops and submits a code change proposal to the International Conference of Building Officials for seismic retrofit standards for existing buildings including nonductile concrete, crossgrain bending in wood ledgers, or nonbearing wall unreinforced masonry.
4. By **September 1995**, the International Conference of Building Officials revises and adopts code change proposals in Milestones 3 and 4.
5. By **December 1995**, the Office of the State Architect and the Building Standards Commission develop and adopt seismic retrofit standards for state and locally regulated buildings.

Resources Needed

State: $30,000 to assist the Office of State Architect and Building Standards Commission in developing uniform retrofit guidelines. The Seismic Safety Commission may request up to $3 million from the Proposition 122 bond fund for earthquake research and development and to assist in developing seismic retrofit standards.

Responsible Agencies

Building Standards Commission (Richard Conrad, Executive
Structural Engineers Assoc. of Calif., Hazardous Buildings Committee (Fred Wilsea, Chairman)
Office of the State Architect (Larry D. Guthrie, Chief, Seismic Program Section)
Seismic Safety Construction Coordinating Council
California Building Officials (Fred Herman, Chief Building Official, City of Palo Alto)
Seismic Safety Commission (Fred Turner, Staff Structural Engineer)
International Conference of Building Officials (Jon Traw, Vice President)
State Historical Building Safety Board (Jud Boies, Executive Secretary)

Status

The Structural Engineers Association of California's Hazardous Buildings Committee efforts are underway. The Building Standards Commission and Office of State Architect are considering hiring of a facilitator to develop guidelines. The Seismic Safety Commission started the second phase of Proposition 122 research and development plan, setting budgets and guidelines for future phases.

References

1. California Building Standards Code, Title 24, California Code of Regulations
2. Seismic Safety Commission, *Breaking the Pattern*, SSC 91-05, 1991
3. Health and Safety Code Section 16109
4. Federal Emergency Management Agency, *Recommended Guidelines for Seismic Strengthening of Existing Buildings, Phase I Issues Identification and Resolution, Phase II Guidelines Development*, ATC-28, 1990

Initiative 1.2
Improve Safety of Older Hospital Buildings

Of the state's 2673 acute-care hospital buildings, over 1800 were built before passage of the 1973 Alfred E. Alquist Hospital Seismic Safety Act that requires new hospitals to be functional after disasters. Although very few pre-act hospitals have been entirely upgraded, portions of other hospitals have been upgraded to comply with the Hospital Act. The attrition rate of older hospitals is not resolving this problem. Approximately one quarter of California's acute-care hospital beds are in buildings that were built before seismic codes and may not provide adequate life safety in a major earthquake, and over half of the remaining acute-care hospital beds are in buildings that may not be capable of providing medical services after a major earthquake. Paying for hospital retrofitting is a crucial problem. Initiative 3.5 calls for health care and emergency medical plans that incorporate expected hospital performance with expected needs for medical treatment after earthquakes.

Objective
By **December 1996**, the Seismic Safety Commission and the Office of Statewide Health Planning and Development establishes an earthquake hazard mitigation program to improve the seismic performance of pre-Hospital Act facilities housing acute-care services to ensure their availability following earthquakes.

Milestones
1. By **January 1992**, the Seismic Safety Commission, in cooperation with Office of Statewide Health Planning and Development, requests all local governments in Zone 4 with unreinforced masonry hospitals in their jurisdictions to notify the Commission about their mitigation programs so that the Office of Statewide Health Planning and Development can incorporate the local programs into the state's program.
2. By **January 1993**, the Seismic Safety Commission, in cooperation with other responsible agencies, seeks legislation that would require Office of Statewide Health Planning and Development to develop and adopt regulations to require owners to evaluate seismic hazards in pre-Act hospitals. The legislation should also require owners to incorporate seismic hazard mitigation into their hospital facility master plans.
3. By **December 1993**, the Office of Statewide Health Planning and Development updates, refines, and disseminates comprehensive nonstructural hazard reduction guidelines for use by hospital maintenance personnel.
4. By **December 1995**, the Office of Statewide Health Planning and Development establishes regulations that define acceptable levels of hospital building performance, create seismic evaluation and retrofit standards, and establish priorities for hazard mitigation of pre-1973 hospital buildings. Regulations should consider many aspects of earthquake hazards including the site, soil and structural characteristics, hospital functions, and the results of the emergency medical services studies conducted in Initiative 3.5.
5. By **January 1996**, the Seismic Safety Commission and the Office of Statewide Health Planning and Development, in cooperation with other responsible agencies and organizations, propose legislation to establish a hazard mitigation program that, upon completion, would improve the seismic performance of all pre-Hospital Act facilities with emphasis placed on reducing the greatest risks first.

Resources Needed
State: The development of regulations by Office of Statewide Health Planning and Development for Milestone 3 can be supported by fees as part of their existing operating budget.

Local and Private: Costs to retrofit one quarter of the pre-Act hospital buildings with the highest life safety risks to full compliance with the Hospital Act to reduce hazards to life range from $8 to $10 billion. Costs to retrofit all pre-Act hospitals to full compliance with the Hospital Act are estimated to range from $12 to $20 billion, or $4 to $7 million annually over the next three decades. Approximately 375 of these hospitals are privately owned; there are 67 district hospitals and 48 county hospitals.

Responsible Agencies

Office of Statewide Health Planning and Development (Gary Pettigrew, Deputy Director, Facilities Development and Planning)2

Emergency Medical Services Authority (Calvin Freeman, Chief, Disaster Medicine Services

California Association of Hospitals and Health Services (Roger Richter, Vice

Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

Privately Owned, District, and County Hospital Organizations

Status

This new initiative is based on the findings and recommendations of the 1987-1992 *California at Risk* Initiative 1.2 for hospital buildings.

References

1. Health and Safety Code Section 15000 *et seq.*
2. 1990 Statutes, Chapter 1650, Section 2
3. Applied Technology Council ATC-23, *General Acute Care Hospital Earthquake Survivability Inventory for California*, December 1989
4. Building Safety Board, *California at Risk Milestone 4 Report, A Recommended Program to Seismically Strengthen Pre-Hospital Act Facilities*, December 1990
5. California Association of Hospitals and Health Services, *Hospital Earthquake Preparedness: Issues for Action*
6. Seismic Safety Commission, *Policy On Acceptable Levels of Earthquake Risk In State Buildings*, SSC 91-01, 1991
7. Health and Safety Code Section 439.3, State Health Plan

Initiative 1.3
Improve Safety of Older Public School Buildings

Since the passage of the Field Act in 1933, Public school buildings constructed in compliance with the act have consistently outperformed other buildings in earthquakes. Strict enforcement of the Field Act provisions by the Office of State Architect has resulted in safe public schools with very low earthquake damage and disruption rates.

However, 70 percent of the state's 36,000 public school buildings were built to early Field Act seismic safety regulations, which were revised in 1959 and again in 1976 based on new information from damage and collapse observed during earthquakes. A major earthquake will still cause a significant loss of school functions and property damage and may cause injuries to students and teachers in these older schools. A small but significant number of older schools pose potentially serious hazards to life during earthquakes.

A separate public school concern is that, according to the Auditor General, there are more than 37,000 portable public classrooms in use that are exempt from the Field Act. Many are not adequately anchored to their foundations, making them vulnerable to major and easily preventable damage in earthquakes.

Objective
By **January 2000**, all school districts identify and reduce unacceptable earthquake hazards in public schools.

Milestones
1. By **July 1992**, the Office of State Architect reviews the inventory of all pre-1976 public school buildings and identifies those needing further seismic hazard evaluations.
2. By **January 1993**, the Seismic Safety Commission sponsors legislation that would require school districts to evaluate and retrofit or replace all early Field Act schools that do not provide substantial life safety by the year 2000.
3. By **December 1993**, the Office of Local Assistance, in consultation with public school districts, identifies and secures funding sources for the seismic retrofit of hazardous public schools.
4. By **January 1994**, the Seismic Safety Commission sponsors legislation requiring portable public school classrooms to be anchored to foundations by the year 2000.
5. By **December 1995**, the Office of State Architect, in cooperation with other responsible agencies, develops and adopts seismic retrofit building standards for substantial life safety in public schools.
6. By **December 1996**, all school districts start actions to ensure that public school buildings provide substantial life safety protection.

Resources Needed
State: Approximately $300,000 for Office of State Architect's review of the building inventory in Milestone
Public Schools: $3 to $5 million for the seismic hazard evaluations; $2 to $5 billion for school seismic retrofits, or $200 to $700 million annually until the year 2000.

Responsible Agencies
Office of State Architect (Larry D. Guthrie Chief, Seismic Program Section)
Office of Local Assistance (William Van Gundy, Executive
Department of Education (Michael Chambers, Architect)4
Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

Status
Office of State Architect has been directed by 1990-91 fiscal year budget language to review the public school inventory, but, due to a hiring freeze on General Fund positions, no staff was hired.

References
1. Education Code Sections 39140 *et seq.*, 39210 *et seq.*, and 39618 to 39621, the Field Act
2. Health and Safety Code Section 19100 *et seq.*
3. Office of Auditor General, *Portable Classrooms*, P-977, May 1991

Initiative 1.4

Develop Falling Hazard Guidelines for State Buildings

Falling hazards can be posed by nonstructural building elements such as parapets, cornices, ceiling and lighting systems, window and building cladding systems, air conditioning, and plumbing and electrical equipment. These hazards are significant to the continuity of building functions if there are earthquakes.

The seismic safety of nonstructural elements in all new construction is largely regulated by the building codes. Before 1976 however, most building codes failed to explicitly regulate the seismic safety of nonstructural elements. As a result, nonstructural elements in older buildings are often unbraced or unattached to the structure and can fall or move excessively during earthquakes. Building contents are addressed by initiative 1.11.

Objective

By December 1995, the Building Standards Commission develops and adopts uniform guidelines for the identification and reduction of falling hazards in existing nonstructural building elements in state government buildings.

Milestones

1. By December 1992, the Building Standards Commission and the Office of State Architect, draft guidelines for the identification and reduction of falling hazards in nonstructural building elements in state government buildings. The draft will be disseminated to state agencies that own buildings for review.
2. By December 1995, the Building Standards Commission develops and approves revised guidelines as standards for the bracing of existing nonstructural elements.

Resources Needed

State: This initiative should be with resources efforts identified in Initiative 1.1 and 1.10.

Responsible Agencies

Building Standards Commission (Richard Conrad, Executive Director)

Office of the State Architect (Larry D. Guthrie, Chief, Seismic Program Section)

Seismic Safety Construction Coordinating Council

Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

Southern California Earthquake Preparedness Project (Gilbert Najera, Director)

Bay Area Regional Earthquake Preparedness Project (Richard Eisner, Director)

Status

To be started.

References

1. Seismic Safety Commission, *Policy on Acceptable Levels of Earthquake Risk In State Buildings,* SSC 91-01, 1991
2. Government Code 8878.97, Public Building Rehabilitation Bond Act, 1990
3. Seismic Safety Commission, *Report to Governor George Deukmejian on Executive Order D-86-90,* SSC 90-06, 1990

Initiative 1.5
Improve Safety of State-Owned Buildings

The state government owns about 18,000 buildings. Many have unreinforced masonry walls but are exempt from the Unreinforced Masonry Building Law that encourages earthquake hazard mitigation. Many older buildings are made of nonductile concrete or other materials likely to collapse during an earthquake. In past earthquakes, these facilities have suffered higher losses than private facilities. The public, state employees, and state functions—including many emergency services—are at risk because of these buildings.

The Commission recommends that state buildings known to be subject to full or partial collapse in an earthquake should be posted with warning and instruction placards so those who use these buildings can make informed decisions whether to enter.

Objective
By **January 2000**, the Office of the State Architect completes a program to ensure that major state government buildings can withstand an earthquake to the extent that collapse is precluded, occupants can exit safely, and functions can be resumed or relocated promptly consistent with the need for their services after earthquakes.

Milestones
1. By **January 1992**, the Seismic Safety Commission seeks legislation for bonding authority to retrofit government buildings.
2. By **December 1992**, each state agency establishes emergency operation and long-term recovery plans and advises the Office of the State Architect of the steps to train employees and protect records and other irreplaceable building contents.
3. By **January 1994**, the Seismic Safety Commission seeks legislation to provide additional bonding authority for the retrofit of government buildings.
4. By **July 1994**, each state agency completes rapid seismic evaluations and posts seismic hazard placards for potentially hazardous state-owned buildings with more than 50 occupants.
5. By **July 1995**, each state agency completes the bracing of high-priority contents and nonstructural elements.

Resources Needed
State: Office of State Architect can conduct the survey in Milestone 1 and initiate retrofit activities using the $250 million in the Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990. January 1990 estimates indicate that the funds required may exceed $1.3 billion. Building surveys, bracing of contents, and preparing emergency operations and recovery plans should be paid from state operating budgets.

Responsible Agencies
Office of the State Architect (Larry D. Guthrie, Chief, Seismic Program)

Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

29 state agencies that own buildings

Department of Finance (Lynn Podesto, Budget Program Manager)

Office of Legislative Analyst (Gerald Beavers, Analyst)

Status
State agencies are completing the building survey in Milestone 1.

References

1. Seismic Safety Commission, *Policy on Acceptable Levels of Earthquake Risk in State Buildings*, SSC 91-01, 1991
2. Seismic Safety Commission, *Report to Governor on Executive Order D-86-90*, SSC 90-06, 1990
3. Government Code 8878.97, Public Buildings Rehabilitation Bond Act, 1990
4. Department of Finance, *Financing Major Capital Outlay Projects 1991-2000*, Government Code 131000
5. The California State University, *A Plan to Increase Seismic Safety at California State University Facilities*, Rev. October 1990
6. University of California, *Policy on Seismic Safety*, 1988
7. Department of General Services, *Action Plan for Implementation of Executive Order D-86-90*
8. University of California, *Plans for Improving the Seismic Safety of University of California Facilities*, August 31, 1990

Initiative 1.6
Improve Essential Services Buildings

Lessons learned in recent damaging earthquakes demonstrate the need to continue essential government services during and after an earthquake. Precautions must be taken to determine acceptable levels of facility performance to ensure post-earthquake availability of functions. The Essential Services Building Act requires new buildings to meet certain construction standards. Older essential services buildings that house emergency operations centers, law enforcement offices, and fire stations, may not be able to remain functional after earthquakes. The potential loss of these functions poses an unacceptable risk because it would slow emergency response and result in unnecessary casualties and property damage.

Objective
By **January 2000**, the Office of State Architect and local governments ensure that all essential government services buildings built before 1986 are identified and the most vulnerable facilities retrofitted or relocated to meet standards that will allow them to remain operational after earthquakes.

Milestones
1. By **July 1992**, the Office of State Architect, in consultation with the Office of Emergency Services, recommends to local governments the actions and funding needed to provide acceptable levels of risk for buildings housing essential services.
2. By **January 1993**, the Seismic Safety Commission proposes legislation, if needed, to require seismic retrofits of pre-1986 essential services buildings.
3. By **December 1994**, the Building Standards Commission and California Building Officials will recommend changes to state regulations, model codes, and standards to reflect the retrofit needs that will enable essential services buildings to remain operational and allow timely resumption of services.

Resources Needed
State: May exceed $200 million.
Local: Unknown.
The Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990 provides $250 million for state government buildings seismic retrofit and $50 million for local government essential services buildings.

Responsible Agencies
Office of State Architect (Larry D. Guthrie, Chief, Seismic Program Section)
Southern California Earthquake Preparedness Project (Gilbert Najera, Director)
Seismic Safety Commission (J.F. Goodfellow, Planner)
Building Standards Commission (Richard Conrad, Executive Director)
California Building Officials (Fred Cullum, Director)
California Emergency Services Association (Jim Bohon, President)
Local Governments

Status
To be started

References
1. Health and Safety Code 16000 *et seq.*, Essential Services Building Seismic Safety Act
2. Seismic Safety Commission, *Policy On Acceptable Levels of Earthquake Risk In State Buildings*, SSC 91-01, 1991
3. Government Code 8878.97 *et seq.*, Public Buildings Rehabilitation Bond Act, 1990

Initiative 1.7

Improve Safety of Older High-Occupancy Buildings

Several types of construction allowed by older building codes have since been identified as potentially hazardous in earthquakes. In particular, buildings with nonductile concrete frames built before 1973 and buildings with soft stories or poor connections can collapse and cause significant loss of life and injury during earthquakes. Of special concern are buildings with high numbers of occupants. In past California earthquakes, more lives have been lost in these types of construction than in any other.

Over 200,000 buildings are suspected to be potentially hazardous—probably far too many to be addressed in the near term by the state's existing economic, design, and construction resources. Thus, emphasis is placed on identifying vulnerable buildings above a certain size, and on requiring owners to address significant seismic hazards.

Objective

By December 1996, the Seismic Safety Commission initiates a program to identify and mitigate or disclose hazards in high-occupancy buildings that pose unacceptable levels of earthquake risk.

Milestones

1. By January 1992, the Seismic Safety Commission sponsors legislation that, if passed, requires development of uniform seismic hazard evaluation and disclosure standards for hazardous buildings.
2. By January 1996, the Seismic Safety Commission sponsors legislation to require owners of high occupancy buildings complete rapid seismic hazard evaluations of high occupancy buildings and to identify any building hazards that pose an unacceptable level of earthquake risk.

Resources Needed

State: Expenses are included in other initiatives.

Local: Expenses are unknown.

Building owners: Financial incentives for building owners are needed.

Responsible Agencies

Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

Status

A bill has been introduced in the legislature to implement this initiative.

References

1. Seismic Safety Commission, *Policy On Acceptable Levels Of Earthquake Risk In State Buildings,* SSC 91-01, 1991
2. Seismic Safety Commission, *Potentially Hazardous Buildings,* SSC 85-04, 1985

Initiative 1.8
Improve Safety of Homes

Before the 1960s, houses often were built without adequate anchorage to their foundations. Many newer houses lack adequate bracing of walls that form the crawl spaces below first floors. Water heaters in older homes, and those replaced by home owners often are not braced or anchored to resist earthquakes. These houses are at risk of sliding off their foundations, cripple-wall collapses, and fires from toppling water heaters in earthquakes.

California's disaster aid programs, and the earthquake recovery fund, give the state a direct financial interest in reducing future earthquake losses and claims resulting from these homes. New incentives are needed to encourage retrofitting.

Chapter 699, Status of 1991 (Cortese) requires those selling homes to disclose known seismic hazards to the purchase upon sale or transfer of title. Prospective purchasers of homes built before 1960 will receive a copy of the *Homeowners Guide to Earthquake Safety* describing seismic hazards associated with residential properties. The seller's disclosure and guide will allow purchasers to consider the earthquake risk when buying homes. The purchaser and the seller can consider needed repairs when negotiating the purchase price.

Currently, real estate professionals such as agents, brokers, appraisers and lenders often are unaware of the seismic hazards associated with homes. A continuing education program is needed to acquaint these professionals to residential seismic hazards and the financial consequences of owning or lending money on homes.

Objective
By **December of 1993**, the Seismic Safety Commission initiates a program that identifies the seismic vulnerability of homes and encourages mitigation.

Milestones
1. By **January 1992**, the Seismic Safety Commission initiates a program that identifies the seismic vulnerability of homes and encourages mitigation.
2. By **July 1992**, the Seismic Safety Commission develops a household earthquake hazard information booklet and disseminates it to realtors and homeowners.
3. By **December 1993**, the Seismic Safety Commission reviews the effectiveness of legislation and information booklet, considers home owner's experience in addressing problems, identifies incentives, and issues a report on conclusions.

Resources Needed
State: The Commission plans to recover costs of developing the household earthquake hazards information booklet through proceeds from the sale of the booklet.
Private: Costs to bolt a home to its foundation should be $1000 to $1500; bracing cripple walls, $1000 to $1500; and bracing water heaters, $45. Financial incentives and alternatives are needed to encourage homeowners. Low-interest loans for seismic retrofits should be made available from the Earthquake Recovery Fund.

Responsible Agencies
Seismic Safety Commission (Brian Stoner, Legislative Liaison)

Department of Insurance (Richard Holden, Project Manager, California Residential Earthquake Recovery Fund)

California Realtors Association (Stanley M. Wieg)

Status
Legislation was signed into law in October 1991 to require disclosure upon sale.

References
1. California Department of Insurance, *Mitigation of Principal Earthquake Hazards to Wood Frame Dwellings and Mobilehomes*, June 1990
2. US Geological Survey, *Earthquake Losses to Single Family Dwellings*, Bulletin 139-A, 1990
3. Bay Area Regional Earthquake Preparedness Project, *Home Buyer's Guide to Earthquake Hazards*, 1989
4. Bay Area Regional Earthquake Preparedness Project, *Strengthening Wood Frame Houses for Earthquake Safety*, 1989

Initiative 1.9
Improve Safety of Mobile Homes

Mobile homes are extraordinarily vulnerable to earthquake damage, mainly because they fall off their supports. There are currently more than 600,000 mobile homes in California. The Department of Housing and Community Development is responsible for certifying commercial mobile home installation systems that resist earthquakes, and is also studying how various types of foundations and installations have performed in past earthquakes.

Objective
By **December 1995**, the Department of Housing and Community Development establishes a program to ensure every new mobile home is installed to resist earthquakes and pursues a program to encourage all mobile home owners to improve foundations by the year 2000.

Milestones
1. By **January 1994**, the Department of Housing and Community Development seeks introduction of appropriate legislation or changes to standards or regulations to ensure that new mobile homes are installed to resist earthquakes.
2. By **January 1995**, the Department of Housing and Community Development seeks introduction of appropriate legislation to ensure that foundations of existing mobile homes are retrofitted as necessary to resist earthquakes.

Resources Needed
State: Department of Housing and Community Development costs should be absorbable.
Mobile Home Owners: Approximately $1000 per coach in additional installation costs or $2000 to upgrade existing support systems.

Responsible Agencies
Department of Housing and Community Development (Ed King, Chief, Codes and Standards Division)
Seismic Safety Commission (Brian Stoner, Legislative Liaison)

Status
HCD is completing the study required by Chapter 615, Statutes of 1990 to evaluate the safety of various types of foundation systems and utility connections. The study was due to the Legislature on April 1, 1991.

References
1. Health and Safety Code Section 18551
2. Code of California Regulations Section 1333
3. Department of Housing and Community Development, *Mobile Home Response to the 1989 Loma Prieta Earthquake*
4. Housing and Community Development, Title 25, California Code of Regulations
5. Department of Insurance, *Mitigation of Principal Earthquake Hazards to Wood Frame Dwellings and Mobilehomes*, June 1990

Initiative 1.10
Conserve Historic Buildings

California's designated historic buildings represent an irreplaceable cultural resource. Many of these structures are vulnerable to earthquakes and are exposed to potential damage that could render them irreparable unless steps are taken to retrofit them in a way that both conserves their historic and architectural qualities, and ensures that they can be repaired after an earthquake. Damaged historical buildings pose an additional dilemma: Repair may be financially unfeasible for the owner, while demolition will remove a valuable community asset. Repair decisions are hindered by lack of repair standards, financial aid, and a method of determining in advance which are the most critical of the vulnerable historically important buildings that should be addressed.

Objective
By **January 2000**, identify, retrofit and conserve California's most important historic buildings and establish a strategy to secure, repair, retrofit and restore damaged historical buildings after earthquakes.

Milestones
1. By **July 1992**, the State Historical Building Safety Board prepares and adopts post-earthquake repair guidelines.
2. By **December 1993**, the Office of Historic Preservation starts a process to identify the most important buildings and develop proposal to provide financial incentives for the strengthening and repair of these buildings.
3. By **January 1995**, the State Historical Building Safety Board, with other responsible agencies, recommends legislation to establish a coordinated disaster response policy.

Resources Needed
State: The resources needed to write the codes will be obtained through voluntary contributions from the professions.
Local: The cost of reporting existing lists of designated historic buildings is minimal.

Responsible Agencies
State Historical Building Safety Board (Jud Boies, Executive Officer)
Office of Historic Preservation (Steade Craigo, Architect)
Department of Commerce (Pat Noyes, Main Street Program)
Seismic Safety Commission (Fred Turner, Staff Structural Engineer)
Bay Area Regional Earthquake Preparedness Project (Richard Eisner, Director)
National Trust for Historic Preservation (Courtney Damkroger, Preservation Officer)
California Preservation Foundation (John Merritt, Executive Director)
National Park Service Preservation Assistance (David W. Look, Chief)
International Conference of Building Officials (Susan Dowty, Engineer)
California Council, The American Institute Architects

Status
To be started.

Reference
1. State Historical Building Code, Title 24, Part 8, California Code of Regulations
2. California Preservation Foundation, *History at Risk,* 1990
3. Chapter 4x, Statutes of 1989
4. Public Law 93-788 as amended by Public Law 100-707
5. Preservation Press, *Protecting the Past From Natural Disasters*

Initiative 1.11
Reduce Workplace Hazards

Unsecured building contents in the workplace can cause serious injury and work disruption to employees in the event of an earthquake. The insurance industry's Earthquake Project estimates there would be from $7.8 to $14.6 billion in general liability and workers' compensation claims in a major urban earthquake. Employers can reduce losses by identifying and anchoring building content hazards and educating their employees in earthquake safety.

The California Building Code requires all storage racks, cabinets, and book stacks more than five feet in height and wall hung cabinets and storage shelves be designed, constructed, and anchored in such a manner as to resist stresses and limit deflections caused by earthquake forces. However, compliance with the Building Code is not mandatory during employee health and safety inspections. Cal/OSHA's Standards Board should adopt seismic safety regulations for building contents consistent with the California Building Code and enforce them in the workplace in public and privately owned buildings.

Objective
By **December 1994**, the Cal/OSHA's Standards Board adopts measures to reduce seismic safety hazards from unbraced building contents in the workplace and to educate employers and their employees in earthquake safety.

Milestones
1. By **July 1992**, the Seismic Safety Commission petitions Cal/OSHA's Standards Board to adopt regulations consistent with the California Building Code.
2. By **January 1993**, the Standards Board makes a decision of granting petition. If needed, the Seismic Safety Commission will sponsor legislation to amend Title 8.
3. By **December 1994**, the Cal/OSHA's Standards Board develops, adopts, and disseminates seismic safety regulations to employers.

Resources Needed
State: There will be minor administrative costs to start this initiative; Cal/OSHA's cost of notification will be negligible since cost for Title 8 regulations are recovered by subscription fees.
Private Sector: While exact costs to secure equipment and inform employees are unknown, it is not anticipated to be a sudden or major expense for businesses and will be offset by decreased repair costs and business losses after earthquakes.

Responsible Agencies
Occupational Safety and Health Standards Board, Department of Industrial Relations (Steve Jablonsky, Executive Officer)

Seismic Safety Commission (Teri DeVriend, Staff Services Analyst)

Status
The Seismic Safety Commission will begin the petitioning process in 1992.

References
1. California Building Code, Title 24, Part 2, California Code of Regulations, Section 2-2312
2. Industrial Relations, Title 8, California Code of Regulations

Initiative 1.12
Review Safety of Federal Dams

The failure of a large water storage facility can cause a tremendous loss of life and property damage. Historically, even relatively small dams have caused fatalities; in 1963 the failure of the Baldwin Hills Reservoir released only 700 acre-feet of water but killed five people. Consequently, special precautions and sound engineering practices are necessary for all major storage water facilities. If dams are not reviewed and inspected to meet stringent state requirements during construction, improvements added later are very costly and usually less effective.

The California Department of Water Resources, Division of Safety of Dams supervises all dams and reservoirs except those owned by the federal government and certain exempt dams. The state program has rigorous evaluation and inspection criteria.

Many federal dams in the western United States have been identified as potential hazards. While other federal agencies, involved in planning, design, and construction of dams, meet state requirements, the US Army Corps of Engineers has allowed federal primacy and exemption from state review to inhibit review of designs and full inspection of construction work by the Division of Safety of Dams. This is critical especially for projects that will be transferred to local control and will fall under state jurisdiction upon completion of construction.

Objective
By **July 1994**, the Department of Water Resources reviews the design, construction, operation, and maintenance of all dams in California, including federal water storage facilities that meet the state "jurisdictional" size to ensure they comply with the state requirements regardless of ownership.

Milestones
1. By **December 1992**, the Department of Water Resources enters into an agreement with all federal agencies to use the state requirements and methods as minimum standards in all federal water projects and reviews the status of existing dams.
2. By **December 1993**, the Department of Water Resources completes a joint review with the federal lead agencies of high-priority facilities to determine whether conservative requirements have been applied appropriately to federal or otherwise exempt projects in California.
3. By **July 1994**, the Department of Water Resources reports to the Governor and Legislature on the seismic safety status of all federal and otherwise exempt dams.

Resources Needed
State: Costs to begin this initiative should be absorbed by DWR until the extent of the problem is identified. After this initial fact-finding, DWR will seek funding to support any continued workload that may be required. The estimated financial and personnel resources needed each fiscal year is as follows: 1991-92, $40,000 and 0.4 P.Y.; 1992-93, $60,000 and 0.6 P.Y.; 1993-94, $100,000 and 1.0 P. Y.; 1994-95, $20,000 and 0.2 P.Y.; and 1995-96, $20,000 and 0.2 P.Y.

Responsible Agencies
Department of Water Resources (Vern Persson, Chief, Division of Safety of Dams)
US Army Corps of Engineers (Jay Soper, Director, Engineering)
US Bureau of Reclamation (Gary Egan, Engineer)
US Forest Service (Bill Huff, Engineer)
Bureau of Land Management (Neil Parrett, position)
U.S. Interagency Committee on Dam Safety (William S. Bivins, Chairman)
Seismic Safety Commission (Richard McCarthy, Geologist)

Status
To be started

Initiative 1.13

Improve Earthquake Performance of Power and Gas Systems

High-voltage substations are the most vulnerable components of power utility systems during earthquakes. Substations contain brittle ceramic circuit breakers, transformers, and other equipment that is sensitive to strong ground motion. Most other components of power systems including transmission systems, power generation facilities, and distribution systems are redundant and seismically rugged.

Gas systems are vulnerable to broken transmission lines, failures at pipe joints, and failed equipment. Because most gas transmission systems are underground, localized damage is unavoidable.

Older portions of power and gas systems were built to lower seismic safety standards or in hazardous soils and can pose significant earthquake risks.

Objective

By December 1995, the Public Utility Commission establishes appropriate and, if possible, uniform seismic safety standards for emergency response and earthquake recovery plans for all power and gas systems.

Milestones

1. By **December 1992**, the power and gas utilities establish suitable and, if possible, uniform emergency response criteria and procedures to assure timely restoration of services and to facilitate repair or replacement of damaged systems.
2. By **December 1993**, the power and gas utilities establish appropriate and, if possible, uniform seismic safety criteria and procedures for the design, construction, and operation of new facilities, and hazard mitigation of existing facilities.
3. By **December 1993**, the power and gas utilities develop and adopt a comprehensive policy on acceptable levels of earthquake risk with long term priorities and schedules for the reduction of unacceptable hazards.
4. By **December 1993**, the Public Utilities Commission determines whether its authority is adequate to ensure that seismic safety standards and emergency response and long-term earthquake recovery plans will be enforced.
5. By **December 1994**, and annually thereafter, the Public Utilities Commission reviews, approves, monitors, and assesses the adequacy of the policy.
6. By **December 1994**, the Public Utilities Commission develops draft standards of acceptable levels of performance for regulated utilities.
7. By **December 1995**, the Public Utilities Commission issues regulations, if required, to enforce the policy on acceptable levels of risk, including seismic safety standards and emergency response and recovery plans.

Resources Needed

State: Resources for implementing this initiative should be provided by the Public Utilities Commission's operating budget.
Utilities: Costs to utilities are unknown but should be provided as part of their operating, management, and maintenance budgets.

Responsible Agencies

Public Utilities Commission (Russel Copeland, Chief, Utilities Safety Branch)

Investor-Owned Utilities

Publicly Owned Utilities

Seismic Safety Commission (Richard McCarthy, Geologist)

Office of Emergency Services (Ron Grasser, Utilities Coordinator)

California Energy Commission (Robert J. Brand, Project Manager, Engineering Office)

Status

This initiative is based on Initiative 1.6 of *California at Risk, 1987-1992*

References

1. Southern California Edison Company's Responses to the Public Utilities Commission Requests Regarding Seismic Preparedness, January 3, 1991
2. Southern California Gas Report to the Public Utilities Commission, December 20, 1990
3. Pacific Gas and Electric Co., *Program for Reducing Earthquake Vulnerability of Gas and Electric Systems*, December, 1990

Initiative 1.14

Improve Earthquake Performance of Water Systems

Water systems include levees, aqueducts, pumping stations, and transmission, treatment and distribution facilities, some of which are vulnerable to earthquakes. Water systems can be rendered inoperable because of damage to tanks and clarifiers, broken transmission lines and failures at pipe joints, and failed equipment.

Because most of the transmission systems are underground, localized damage to such systems is unavoidable. Water transmission and distribution agencies should have aggressive retrofit, repair, and replacement programs underway giving priority to areas most vulnerable to earthquake damage. Agencies should also stockpile replacement components needed after earthquakes.

Damage from water sloshing in tanks and clarifiers is unavoidable during earthquakes, but economical, preventative measures can be taken to reduce the amount of damage and recovery times after earthquakes.

The levees of the Sacramento-San Joaquin Delta may fail in a major earthquake, jeopardizing the quality of State and Federal water project water and increasing the potential for salt water intrusion. Many of the state's aqueducts cross active faults and are vulnerable to fault rupture.

Objective

By **December 1996**, the Department of Water Resources establishes appropriate and, insofar as practical, uniform seismic safety standards and emergency response and recovery plans (including mutual aid plans) for all state water systems.

Milestones

1. By **December 1992**, all responsible organizations identify and report to the Department of Water Resources their applicable seismic safety standards and procedures for the design, construction and operation of new water facilities, and for the operation of existing facilities.
2. By **December 1993**, all responsible organizations identify and report to Departments of Health Services and Water Resources on their emergency response plans and procedures for the timely repair or replacement of earthquake-damaged water systems.
3. By **December 1994**, the Department of Water Resources, the State Water Resources Control Board, and the California Association of Water Agencies establish appropriate and, insofar as practical, uniform seismic safety criteria and procedures for the design, construction, and operation of new facilities, and hazard mitigation and reliability improvement for existing facilities.
4. By **December 1994**, the Department of Water Resources, in cooperation with the US Army Corps of Engineers, completes its earthquake risk analysis of the Sacramento-San Joaquin Delta levee system and develops long-term hazard reduction and emergency response plans for stabilizing levees and preserving freshwater supplies.
5. By **December 1995**, the Department of Water Resources, in cooperation with all responsible organizations, develops and adopts a comprehensive policy on acceptable levels of earthquake risk in water systems with priorities and schedules for the reduction of unacceptable vulnerabilities. Annually thereafter, the Department of Water Resources reviews and assesses the adequacy of the policy on acceptable levels of earthquake risk in water systems.
6. By **December 1996**, the Departments of Water Resources and Health Services, in cooperation with the Seismic Safety Commission, report to the Legislature and make recommendations for any additional state authority needed to develop and enforce an effective policy on acceptable levels of earthquake risk, including uniform seismic safety standards and emergency response and recovery plans if required.

Resources Needed

State: Resources for implementing this initiative should be provided by the operating, management, and maintenance budgets of the Departments of Water Resources and Health Services and the State Water Resources Control Board. If additional funding is needed, these agencies should request it from the Legislature.

Local: Resources for implementing this initiative should be provided by the utilities' operating, management, and maintenance budgets.

Responsible Agencies

Department of Water Resources (James U. McDaniel, Deputy Director; Les Harder, Division of Design and Construction)

Department of Health Services (Peter A. Rogers, Chief, Office of Drinking Water)

State Water Resources Control Board (K. Wassermann, Chief, Engineering Branch)

US Army Corps of Engineers (Jay Sopen, Chief, Engineering Directorate; Walter Dey, Assistant Chief, Engineering Directorate; Dan Parillo, Chief, Geotechnical Division)

Association of California Water Agencies (John Fraser, Executive Director/General Counsel)

Seismic Safety Commission (Richard McCarthy, Geologist)

American Society of Civil Engineers' Technical Committee on Lifeline Earthquake Engineering (Don Ballantyne, Chairman, Water/Sewer Subcommittee)

California Urban Water Agencies (Lyle Hoag, Executive Director)

Individual water utilities serving urban populations

Office of Emergency Services (Ron Grasser, Chief, Utilities Division)

Public Utilities Commission (R. Copeland, Chief, Utility Safety Branch)

American Water Works Association (Norm Lougee, Chairman, Emergency Planning Committee)

Status

To be started.

References

1. Kennedy/Jenks/Chilton, *1989 Loma Prieta Earthquake Damage Evaluation of Water and Wastewater Treatment Facility Nonstructural Tank Elements*, December 1990

2. Department of Water Resources, *Sacramento-San Joaquin Delta Emergency Water Plan*, December 1986

Initiative 1.15
Improve Earthquake Performance of Sanitation Systems

Sanitation systems are vulnerable to earthquakes. Ground motion can break transmission lines and cause failures of pipe joints, pumping facilities and equipment. Damage to sanitation systems might pollute water supplies. Since most facilities are underground, damage is unavoidable.

Sanitation agencies should consider earthquake hazards in locating new facilities and replacing old ones and should have aggressive retrofit, repair, and replacement programs in vulnerable areas. They should stockpile sufficient components for repairs. Sloshing liquids in tanks and clarifiers may be unavoidable during earthquakes, but economical preventive measures can reduce damage and recovery times.

Objective
By **December 1996**, the State Water Resources Control Board establishes appropriate uniform seismic safety standards and emergency response and earthquake recovery plans, including mutual aid plans, for all sanitation systems in the state.

Milestones
1. By December 1992, the Technical Council on Lifeline Earthquake Engineering compiles a summary of sanitation utility earthquake damage from the Loma Prieta and other earthquakes and reports to the State Water Resources Control Board and California Association of Sanitation Agencies on reducing future damage and disruption to sanitation operations.
2. By **December 1993**, all responsible organizations report to the State Water Resources Control Board their applicable seismic safety standards and procedures for design, construction, and operation of new and existing sanitation facilities.
3. By **December 1994**, all responsible organizations identify and report to the State Water Resources Control Board and Department of Health Services their emergency response plans and procedures for the timely repair or replacement of earthquake-damaged sanitation systems.
4. By **December 1995**, the State Water Resources Control Board in cooperation with all responsible organizations develops and adopts a comprehensive policy on acceptable levels of risk in sanitation systems with priorities and schedules for meeting achieving them.
5. By **December 1996**, the State Water Resources Control Board, with the Seismic Safety Commission, should report to the Legislature and make recommendations for additional state authority needed to develop and enforce a policy on acceptable levels of earthquake risk, including uniform seismic safety standards and emergency response and recovery plans if required.

Resources Needed
State: Resources can be provided by the State Water Resources Control Board operating budgets. If additional funding is needed, the Board should request it from the Legislature.
Local: Resources can be provided by sanitary agencies' operating budgets.

Responsible Agencies
State Water Resources Control Board (K. Wasserman, Chief, Engineering Branch)
Regional water quality control boards
California Association of Sanitation Agencies (Finn T. Halbo, Director)
Department of Water Resources (James U. McDaniel, Deputy Director)
Department of Health Services (Peter A. Rogers, Chief, Office of Drinking Water)
Sanitation districts serving urban populations
Seismic Safety Commission (Richard McCarthy, Geologist)
Office of Emergency Services (Ron Grasser, Chief, Utilities Division)
American Society of Civil Engineers' Technical Committee on Lifeline Earthquake Engineering (Don Ballantyne, Chairman, Water/Sewer Subcommittee)

Status
To be started.

Reference
Kennedy/Jenks/Chilton, *1989 Loma Prieta Earthquake Damage Evaluation of Water and Wastewater Treatment Facilities Nonstructural Tank Elements*, December 1990

Initiative 1.16

Improve Earthquake Performance of Transportation Structures

The Department of Transportation (Caltrans) has begun to receive adequate funding for its ongoing seismic retrofit program for older bridges. This effort was accelerated pursuant to Executive Order D-86-90 and the Legislature's mandate that seismic safety remain a priority consideration for the allocation of future transportation funds.

The department is focusing on the retrofit of the state's single- and multiple-column bridges as well as on major toll bridges that are most vulnerable to earthquakes, critical to emergency response capabilities, or that pose the greatest threat to the state's economy.

Objective

By **December 1995**, the Department of Transportation completes its detailed hazard reduction action plans developed pursuant to the Governor's Executive Order D-86-90 and the Legislature's mandate for priority consideration for seismic safety in the funding of transportation projects.

Milestones

1. By **December 1992**, all local transportation agencies and districts report to the California Transportation Commission regarding their progress toward adopting and implementing the seismic safety goals established by state law and Executive Order D-86-90.
2. By **December 1993**, the Department of Transportation completes seismic retrofit designs and awards contracts for Category 1 single- and multiple-column bridges.
3. By **December 1993**, the California Transportation Commission and the Seismic Safety Commission seek legislation to establish funding sources for the seismic retrofit of local transportation agency and district bridges.
4. By **December 1994**, the Department of Transportation completes seismic retrofit designs and awards contracts for major toll bridges.
5. By **December 1995**, the Department of Transportation reports its progress toward complying with the detailed earthquake hazard reduction action plans developed pursuant to the Governor's Executive Order D-86-90 and the Legislature's mandate for priority consideration of seismic safety funding. The Department should also report on its programs for professional development in its earthquake engineering disciplines.
6. By **December 1996**, the California Transportation Commission and the Seismic Safety Commission review and reassess the adequacy of the seismic safety plans and programs of the Department of Transportation described in Milestone 5 as well as local transportation agency programs and report to the Legislature and the Governor.

Resources Needed

State: About $920 million is currently estimated for the seismic retrofit of Category 1 single- and multiple-column bridges. Costs for the retrofit of the state's major toll bridges in Category 1 are as yet undetermined. State gas tax and toll revenues and Federal highway revenues are the primary funding sources.
Local: Costs, policies, and schedules have not been determined.

Responsible Agencies

Department of Transportation (James Gates, Chief, Office of Structure Earthquake Engineering)

California Transportation Commission (Robert I. Remen, Executive Director)

Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

Approximately 500 local transportation agencies and districts

San Francisco Bay Conservation and Development Commission, Engineering Criteria Review Board (Dave McMahon, Senior Engineer)

Status

Actions are under way to meet the Milestone 1 and 2 objectives.

References

1. Government Code Section 14052
2. Seismic Safety Commission, *Executive Order D-86-90*, SSC 90-06, 1990

Initiative 1.17

Improve Earthquake Performance of Offshore Oil Facilities

At the present time, there are about 35 major hydrocarbon drilling, production, and quarters platforms located in state and federal waters offshore California. These platforms are in water depths ranging from 20 ft. to more than 1,000 feet. Some of these structures are over 30 years old. The configurations of these platforms range from conventional steel, pile-supported, template-type structures to self-floating, pile-supported tower-type structures with large diameter legs. A platform is one component of an integrated system intended to drill and produce hydrocarbons. The other components, subsea pipelines, risers, and terminals, are of equal concern.

Although it appears economical to extend the life and increase the productivity of many existing fields, the remaining reserves may not justify complete replacement of the older production platforms and facilities. Because of the sensitivity of the marine environments of offshore California whatever is done to extend the lives of these facilities must be done so that no undue risks are posed to these environments. There are critical questions regarding the appropriate level of performance, how to extend the lives of these structures, and how to decide which structures to remove from service.

Objective

By December 1993, the State Lands Commission develops standard procedures and guidelines to requalify existing offshore hydrocarbon production facilities instate and federal waters offshore California.

Milestones

1. By June 1992, the State Lands Commission conducts a meeting with the Minerals Management Service, the Seismic Safety Commission, and others to discuss the status of the current *API Recommended Practice 2A (RP2A) for Planning, Designing and Constructing Fixed Offshore Platforms* and differences in current review procedures used by the Minerals Management Service and the State Lands Commission.
2. By December 1992, the State Lands Commission, in consultation with the Minerals Management Service and the Seismic Safety Commission, reports on the appropriateness of the API Guidelines and recommends any needed changes.
3. By December 1993, the State Lands Commission adopts standardized review procedures and design guidelines for existing and future offshore California hydrocarbon producing facilities.

Resources Needed

State: Approximately $50,000 from the State Lands Commission
Federal: Approximately $50,000 from the Minerals Management Service

Responsible Agencies

State Lands Commission (Martin Eskijan, Reservoir Engineer)
U.S. Minerals Management Service (Charles Smith, Research Program Manager)
California Coastal Commission (Lesley Ewing, Coastal Engineer)
Seismic Safety Commission (Richard McCarthy, Geologist)
University of California (Robert Bea, Professor)

Status

To be started.

References

1. American Petroleum Institute, Recommended Practice 2A (RP2A) for Planning, *Designing and Constructing Fixed Offshore Platforms*
2. Department of the Interior, Minerals Management Service, 30CFR Parts 250 and 256, *Oil and Gas and Sulphur Operations in the Outer Continental Shelf; Final Rule,* April 1988

Initiative 1.18

Improve Performance of Transportation and Infrastructure

The state's commerce depends on a number of transportation systems to move goods, products and people. These systems depend on facilities at risk during earthquakes. Port facilities, airports, pipelines, warehouses and railroad lines play a crucial role in the state's economy and in the recovery of a region. The level of earthquake performance expected by the owners and operators of these facilities is not clear and the level considered appropriate, or acceptable, from the public's point of view is not clear. Acceptable levels of earthquake performance will vary with the degree of risk, the importance of the functions carried out by the facility, the length of time before operations should be restored.

Owners of these facilities need to develop and exercise clear policies on acceptable levels of earthquake risk that include goals, priorities, earthquake performance objectives, responsibilities and schedules for compliance.

Objectives

By December 1996, the major companies and agencies that own and operate facilities essential to the state's economy and disaster recovery, adopt policies on acceptable levels of earthquake performance and plans to mitigate unacceptable hazards and restore operations within identified recovery times.

Milestones

1. By December 1992, the Seismic Safety Commission identifies the entities essential to carrying out this initiative.
2. By December 1994, the entities identified in Milestone 1 describe to the Seismic Safety Commission the levels of performance they believe appropriate.
3. By December 1995, the responsible state agencies, identified in Milestone 1, recommend policies and actions needed to achieve an acceptable level of performance.

Resources Needed

State: The resources needed to begin this work will be absorbed by the Seismic Safety Commission.

Responsible Agencies

Public Utilities Commission (Russ Copeland, Chief Utility Safety Branch)

California Coastal Commission (Liz Fuch, Coastal Program Manager)

San Francisco Bay Conservation and Development Commission (W. Travis, Deputy Director)

State Lands Commission (Paul Mount, Chief, Mineral Resources Management Division)

Seismic Safety Commission (Richard McCarthy, Geologist)

Railroad Companies

Oil and Chemical Product and Companies

Major Airports

Major Ports

Status

To begin

References

1. Seismic Safety Commission, *Policy on Acceptable Levels of Earthquake Risk in State Government Buildings*, SSC 91-01, 1991.

Initiative 1.19

Clarify Seismic Hazard Mitigation Liability Issues

Governmental actions dictating strengthening and mitigation of seismic hazards, as well as innovative methods of maintaining the structural integrity and functionality of buildings during and immediately after an earthquake, raise legitimate concerns of tort liability in both the public and private sectors.

Buildings constructed to out-of-date standards pose the greatest life-safety risk in an earthquake. Local governments have the authority and the responsibility to protect their populations from hazardous buildings. Design professionals have the capability to design and construct buildings that maintain their structural integrity during and immediately after an earthquake. Proper buildings practices, retrofitting existing buildings posing a high likelihood of collapse during seismic events, and innovative structural designs and components in new buildings will significantly reduce earthquake-related casualties.

The tort liability issue of whether one has met the legal standard of due care to a foreseeable plaintiff has inhibited innovation by those involved in the seismic retrofitting of potentially hazardous buildings, as well as the development of seismically resistant new buildings. Local governments and design professionals need a clearly defined legal benchmark to use when their professional judgment calls for deviation from existing building codes in their efforts to mitigate seismic hazards in buildings and structures.

Objective

By **December 1993**, the Seismic Safety Commission clarifies tort liability issues affecting the mitigation of seismic hazards, including employing innovative methods to maintain integrity and functionality of buildings during an earthquake, and to what extent they may be avoided, mitigated, or imposed upon either local governments or design or construction professionals.

Milestones

1. By **December 1992**, the Seismic Safety Commission convenes a workshop to clarify to what extent tort liability may be avoided, mitigated, or imposed upon either local governments or design professionals for strengthening and mitigating seismic hazards, and the use of innovative methods of maintaining the structural integrity and functionality of buildings during and immediately after an earthquake.
2. By **September 1993**, the Seismic Safety Commission provides the Legislature, the Governor, and local governments a report discussing the issue, including suggestions on how local governments and design professionals may exercise their creativity and judgment without undue apprehension of incurring a large tort liability judgment.
3. By **January 1994**, the Seismic Safety Commission after consultation with local jurisdictions, the Governor, the Legislature, as well as supporting and concerned organizations and agencies, submits proposed legislation, if needed, to clarify the tort liability concerns of local governments and design professionals.

Resources Needed

State: The Seismic Safety Commission will conduct the suggested workshops, research, and legislative advocacy with existing staff and fiscal resources.

Responsible Agencies/Organizations

Seismic Safety Commission (Tim Cronin, Staff Counsel)

State Bar of California (Larry Walsh, Director of Real Property Section)

California Trial Lawyers' Association (Nancy Peverini, Associate Legislative Counsel)

Association of Bay Area Governments (Ken Moy, Attorney)

County Supervisors Association of California (Fred Keeley, Santa Cruz County Supervisor)

League of California Cities (name, position)

Structural Engineers Association of California

California Council/American Institute of Architecture (Aimee Hall, Legislative Assistant)

Earthquake Engineering Research Institute (Frank E. McClure, Structural Engineer)

Status

To be started.

Initiative 1.20

Develop Civil Procedures for Seismic Hazard Mitigation

State and local governments must not compromise the constitutional principle of due process and the prohibition against taking of property without compensation when mandating the mitigation of seismic hazards on private property. Resultant litigation may interfere with, and delay, seismic hazard mitigation. As long as there exists a strong public safety rationale and nexus to seismic hazard mitigation standards, and so long as owners' property rights are not substantially diminished, the courts have tended to uphold seismic hazard mitigation measures.

Policymakers must insure that seismic hazard mitigation policies are based on a demonstrable need supporting the determination to dictate mitigation. The procedures used to implement such policies must incorporate sound judgment, peer review, due process, and expeditious judicial review to protect both the public safety and the economic rights of property owners.

Objective

By December 1993, the Seismic Safety Commission provides guidelines for local government that clarify the extent strengthening and seismic hazard mitigating costs may be imposed within the constraints of the constitutional principles regarding due process and taking of property without compensation.

Milestones

1. By December 1992, the Seismic Safety Commission convenes a workshop of agencies and organizations to develop guidelines on the "due process" and "taking" issues.
2. By December 1993, the Seismic Safety Commission submits a report to the Governor and the Legislature recommending executive and legislative actions that need to be taken to clarify the "due process" and "taking" issues.
3. By December 1993, the Seismic Safety Commission provides guidelines to clarify the "due process" and "taking" issues for local jurisdictions and propose legislation, as needed.

Resources Needed

State: The Seismic Safety Commission should absorb administrative costs not covered by workshop fees to conduct the suggested workshops and provide research and legislative advocacy.

Responsible Agencies

Seismic Safety Commission (Tim Cronin, Staff Counsel)

State Bar of California (Larry Walsh, Director of Real Property Section)

California Trial Lawyers Association (Nancy Peverini, Associate Legislative Counsel)

League of California Cities

County Supervisors Association of California (Fred Keeley, Santa Cruz County Supervisor)

Earthquake Engineering Research Institute (L. Crane Miller, Attorney at Law)

Status

Action began on this initiative in 1991.

References

Government Code Section 8656

Category 2
New Facilities

New construction offers some of the most cost effective opportunities for improved earthquake safety. If seismic safety requirements are considered during the planning, design, and construction of new development, there will be fewer hazardous buildings and other facilities in the year 2000 and beyond. Although current seismic safety practices are typically considered adequate for life safety, several key issues, especially those related to reducing loss of function, need to be addressed. This requires recognition of levels of seismic risk in the standards to keep pace with technical advances in the evaluation of site hazards and design and construction practices. Improving current construction standards and practices for new development is clearly a reasonable approach for reducing future hazards. This will require California to continue assessing the adequacy of its seismic safety construction standards.

Owners of new facilities must recognize that building codes are minimum seismic safety standards and may not ensure a repairable or functional building after an earthquake. Insisting on higher-than-minimum levels of seismic safety may be an owner's most prudent and cost-effective business decision even though constructing a safer structure may cost more initially. When owners weigh the cost of maintaining and repairing a building over its lifespan, the initial expense of higher standards may actually cost less than earthquake-caused damage and business disruption.

To make new construction perform better in earthquakes, improvements are needed in the following areas:

- The public's ability to identify and select acceptable levels of risk
- Land use planning and regulation
- Levels of risk in building codes and better enforcement
- Knowledge and skills of building designers, plan checkers, inspectors, and construction personnel

Land Use

Local governments have the primary responsibility for developing land use plans, passing zoning ordinances, and approving building projects. They are also responsible for creating general plans that consider seismic safety. While most jurisdictions have general plans, many lack specific information or policies about seismic hazards that would help them to make better land use and planning decisions.

AB 3897 (Chapter 1168 Statutes of 1990) created a new statewide seismic hazard mapping and technical advisory program to assist cities and counties in fulfilling their responsibilities for protecting the public from the effects of strong ground shaking, liquefaction, ground failure, landslides, tsunami, and other seismic hazards. With this information available, local jurisdictions will soon be able to make better planning decisions and improve earthquake hazard mitigation programs. The information may also help guide the pattern of future development and redevelopment, including reconstruction during a community's earthquake recovery.

Building Codes

Few citizens, including building owners, realize that the primary earthquake performance objective of the seismic provisions in the Uniform Building Code (UBC) is to enable the occupants to exit the damaged structure safely. The building itself may be damaged, or be unrepairable; even if it can be repaired, it may be out of service for a year or more. Besides damage to the structure, nonstructural elements—equipment, exterior cladding, windows, mechanical systems, etc.—and building contents may be destroyed. In short, a building built to minimum UBC standards may be unusable and not even repairable after an earthquake. Once understood, this may not be acceptable to the building owner and tenants, or to the lending institutions or insurers with interests in the building.

The appropriate level of post-earthquake performance that is needed must be explicitly considered when buildings are

constructed. The Commission's 1991 report, *Policy on Acceptable Levels of Earthquake Risk in State Buildings*, recommends that state government building owners become aware of their buildings' anticipated earthquake performance and take steps to relocate or reduce disruption of functions after an earthquake.

Architects and engineers should emphasize to owners that design techniques be available to provide differing levels of earthquake performance, and should insist that owners consciously choose the level of performance appropriate to the intended lifelong use of the structure. The Office of the State Architect is developing procedures that consider the impact of using higher design standards on operations and maintenance and on considering future earthquake losses when making capital outlay decisions on state buildings. The concept of life cycle costs, introduced by Chapter 988, Statutes of 1989 to evaluate state buildings, provides a reasonable way to make similar decisions in the private sector as well. It may not make sense to build a new facility to minimum, life-safety-only standards when the added cost of higher standards could pay for itself with lower damage costs and less loss of function after earthquakes.

Design and Construction Professionals' Skills

Codes, standards, and appropriate performance objectives will remain only good intentions unless the facility is properly designed and constructed. Enforcement and execution of quality construction are equally as important as standards and objectives. Enforcement includes the need for an independent peer review of the designs for all important structures; independent checking of design drawings, calculations, and specifications by qualified plan checkers; adequate construction inspection to assure the plans are being followed; and observation of key construction details by the design professional.

Seismic design is changing rapidly. Members of the design professions must constantly strive to stay abreast of new developments in the field, and professional organizations must encourage members to do so as well as set standards of good practice.

Building officials play an essential role in assuring adequate seismic performance are used for structures, whether they be single-family homes or complex modern high-rises. But building departments are burdened with heavy workloads, challenged to keep good staff, and hampered by tight budgets. Many lack the resources to stay current with the latest information and techniques needed to achieve the highest levels of seismic safety. The California Building Officials, League of California Cities, and County Supervisors Association of California should consider setting minimum training and experience guidelines for building departments. Voluntary peer evaluations should determine if building departments are adequately checking plans and inspecting construction. Building departments should encourage, if not require, independent peer reviews of major construction. The building officials could offer training and certification for individuals, and conduct performance audits of a department's procedures, staff capabilities, and policies at the request of a jurisdiction.

Other Facilities

State and local governments construct and regulate new bridges, water and sewer utilities, and other public and private infrastructures. Seismic safety in these new facilities depends heavily on the application of appropriate standards, the quality of design and construction, the qualifications of personnel responsible for the work, and independent reviews. Governments should support efforts to improve seismic safety practices, develop standards, and research these diverse and highly specialized areas.

Objectives

The general objectives of the California Earthquake Hazards Reduction Program that relate to this category are to:

- Improve the use of seismic safety information in local government land use plans and private sector building decisions.
- Begin development of seismic safety code provisions for new construction

based on energy absorption and multiple level design earthquakes.

- Encourage owners to specify the earthquake performance and post-earthquake functions and conditions desired of their new structures, and improve the ability of design and construction professionals to meet these higher building performance standards.
- Develop a consensus methodology for considering life-cycle costs in the planning for capital outlay.
- Establish continuing education goals for architects, civil and structural engineers, local government plan checkers, and construction inspectors.
- Initiate voluntary peer evaluation of local and state agency plan checking procedures and personnel qualifications.
- Require independent peer reviews of designs for all important new facilities.
- Establish a program to evaluate and improve professional standards.

Initiative 2.1
Improve Seismic Standards for New Construction

The state relies on the volunteer efforts of professional associations with assistance of building officials to revise seismic safety provisions in the Uniform Building Code (UBC). Lessons from earthquakes, changes in practice, and the increasing complexity of seismic safety provisions burden the volunteer code development process.

The code revision process is slow. Between experience and revision, many buildings can be built without the benefit of the lessons learned from earthquakes.

Earthquake engineering research and efforts to improve seismic safety building provisions are not well funded and are focused on national needs and construction practices appropriate for parts of the nation with less seismic hazard than California. The new Seismic Hazards Mapping Program of the Division of Mines and Geology may provide information that will require major updates to keep the UBC current.

Objective
By **December 1996**, the Building Standards Commission and the International Conference of Building Officials adopt improved seismic provisions for building codes.

Milestones
1. By **June 1992**, the Structural Engineers Association of California, with other responsible agencies, studies recent developments in seismic hazard zonation and makes code change proposals.
2. By **June 1992**, the Seismic Safety Commission appoints a committee to study developments in the identification and evaluation of liquefiable soils and to recommend code changes.
3. By **June 1992**, California's chapters of the International Conference of Building Officials develop, with other responsible agencies, a code change proposal to define the UBC's performance objectives.
4. By **December 1993**, the Structural Engineers Association of California, with other responsible agencies, studies load-resistance-factor design methods for all materials and develops a code change proposal.
5. By **June 1995**, the Structural Engineers Association of California, with other responsible agencies, proposes changess to the UBC to address the effects of frequent moderate earthquakes.
6. By **June 1996**, the Building Standards Commission and the International Conference of Building Officials adopt improved codes for new building construction.

Resources Needed
As yet undetermined. Past code development efforts have not involved state funding, but this could change pending the products of Milestone 3. Earthquake engineering research needs relating to code issues are estimated to be on the order of $500,000 annually (see Initiative 5.1).

Responsible Agencies
Building Standards Commission (Richard Conrad, Executive Director)

Office of State Architect (H. Patrick Campbell, Chief, Structural Safety Section)

Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

California Building Officials (Fred Herman, Chairman, Seismic Safety Committee)

International Conference of Building Officials (John Traw, Vice President)

Structural Engineers Association of California (Ronald Gallagher, Chair, Seismology Committee; J.P. Singh, Chair, Ground Motion Committee)

Status
Volunteer code development efforts underway.

References
1. Health and Safety Code Section 18914
2. Uniform Building Code, 1991
3. Structural Engineers Association of California, Code 2000, 1991

Initiative 2.2
Map Geologic Hazards

Strong ground shaking, liquefaction, landslides, and other types of ground failures account for approximately 95 percent of economic losses caused by earthquakes. Areas subject to these processes during earthquakes have not been identified or mapped statewide despite the fact that scientific techniques are available to do so. The Seismic Hazards Mapping Act requires the State Geologist to identify and map seismic hazard for use by cities and counties in preparation of the safety elements of their general plans and to encourage regulation of new development to reduce these hazards and protect public health and safety. New projects undertaken within seismic hazard zones will require geotechnical studies to identify appropriate mitigation measures.

Objective
By **July 1992**, the State Geologist begins compiling maps for local government use, in accordance with the guidelines and priorities established by the State Mining and Geology Board, to identify seismic hazard zones for use by jurisdictions.

Milestone
1. By **January 1992**, the State Mining and Geology Board will adopt regulations to be employed by the Division of Mines and Geology in the zoning of seismic hazards and for use by local governments in granting building permits within the zones.

Resources Needed
State: The enabling legislation established a Seismic Hazards Identification Fund to provide funding for this newly established program. Initial annual revenues of approximately $1.25 million from locally collected building permit fees and $1.25 million from the state's earthquake insurance fund are anticipated.
Local: Local jurisdictions will be allowed to collect a 5 percent fee for administrative costs to collect the building fees.

Responsible Agencies
Division of Mines and Geology (James F. Davis, State Geologist)
State Mining and Geology Board (Deborah Herman, Executive Officer)
Seismic Safety Commission (Richard McCarthy, Geologist)
Cities and counties

Status
Preparation of guidelines for seismic hazard zone maps is underway.

References
1. 1990 Statutes, Chapter 1168 (AB 3897), Seismic Hazards Mapping Act
2. Public Resources Code Section 2203, Geologic Hazards Annual Report

Initiative 2.3
Establish Independent Seismic Design Review Policies

Independent seismic safety reviews are typically used for critical facilities such as dams and power generation plants. Independent reviews recognize the value of a second opinion as an effective mechanism to assure the quality and integrity of a facility including its seismic safety design.

The state and local governments lack consistent policies on the use of independent seismic safety reviews for other types of facilities such as bridges, water treatment plants, cellular towers, levees, and important buildings. Such a policy is needed to define the circumstances under which independent reviews are necessary, minimum qualifications of reviewers, and procedures.

Objective
By December 1994, the Seismic Safety Commission develops and adopts an updated policy on the use of independent seismic safety reviews and recommends measures to implement it.

Milestones
1. By July 1992, the Seismic Safety Commission creates and appoints members to a new Independent Seismic Safety Review Policy Committee.
2. By July 1993, the Independent Seismic Safety Review Policy Committee develops a draft policy on independent seismic safety reviews and submits it to the Seismic Safety Construction Coordinating Council for review and to the Seismic Safety Commission for approval.
3. By December 1993, the Seismic Safety Commission adopts a schedule to implement the policy.
4. By December 1994, the California Building Officials and the Building Standards Commission consider adopting the policy and schedule to encourage use of independent seismic safety reviews.

Resources Needed
State: 1/4 personnel year at the Seismic Safety Commission

Responsible Agencies
Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

Seismic Safety Construction Coordinating Council (name, Chief, Seismic Safety Program)

Building Standards Commission (Richard Conrad, Executive Director)

California Building Officials (Fred Herman, Seismic Safety Committee)

Office of State Architect (H. Patrick Campbell, Chief, Structural Safety and Larry D. Guthrie, Chief, Seismic Programs Section)

Structural Engineers Association of California (Karrin Kuffel, Chairman, Technical Activities Committee)

Status
To be started

References
1. Seismic Safety Commission, *Independent Review of Critical Facilities: With Special Emphasis on State-Federal Relationships and Dam Safety*, SSC 81-01, 1981
2. Health and Safety Code Section 16109, Independent Review of new earthquake hazard mitigation technologies

Initiative 2.4

Improve State Agencies' Seismic Design and Construction Practices

Authority for state government design, regulation and construction is currently vested in over twenty state agencies with a variety of staff capabilities, management systems, and resources.

The state has no uniform process, standards, or procedures for the design, regulation, and construction of state facilities to ensure the full consideration of seismic safety. Many state agencies place their design, regulation, construction, and enforcement authorities within the same divisions and, in some cases, use the same personnel for other functions. This practice can jeopardize the seismic safety of facilities because of potential conflicts of interest and a possible lack of accountability—completing a project on time and under budget may take precedence over enforcement of seismic safety standards.

The state's existing multistep, project-specific capital outlay process tends to restrict the flexibility of design and construction. Projects are routinely delayed, and scopes of work cannot be easily refined during the development of a project A program-based capital outlay process could minimize these problems.

Objective

By December 1994, the Seismic Safety Commission proposes statutory, administrative, and regulatory changes in state government to use program-based budgeting where possible and ensure the accountability, staff qualifications, and resources needed to develop and enforce minimum seismic safety regulations for the design and construction of all state-owned and state-regulated facilities.

Milestones

1. By December 1992, the Legislature considers the recommendations of the Building Standards Commission's Task Force on Design and Construction Policy Phase I and II Reports.
2. By December 1994, the Legislature considers the adoption of program-based budgeting where possible to increase the flexibility and efficiency of state design and construction programs.
3. The Seismic Safety Commission reviews legislation that addresses state design, regulation, and construction policy to ensure that changes in state laws address the need for accountability, government staff qualifications, and the resources to ensure seismic safety.
4. On a continuing basis the Building Standards Commission assesses the state's design and construction policies and recommends measures to improve its efficiency and accountability.
5. On a continuing basis the Building Standards Commission, in cooperation with the California Building Officials, reviews and identifies regulations that can be purged from the State Building Standards Code to streamline the enforcement of seismic safety by minimizing wherever possible the use of state amendments to the model codes.

Resources Needed

None identified

Responsible Agencies

All state agencies with design and construction authority

Office of the State Architect (H. Patrick Campbell, Chief, Structural Safety Section)

Building Standards Commission (Richard Conrad, Executive Director)

California Building Officials (Warren O'Brien, President)

California Council, The American Institute of Architects (Roderic Ward, Building Standards Commissioner)

Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

Status

To be started.

Reference

Health and Safety Code Section 16109

Initiative 2.5
Improve Seismic Safety Training of Professionals

Knowledge among design and construction professionals about seismic safety is limited because most universities do not require seismic safety courses. Furthermore, the field of seismic safety is relatively new and and seismic safety concepts are changing fast. Many developments have occurred after most professionals completed their formal education. There is an urgent need for continuing education of design and construction professionals in seismic safety.

Objective
By **December 1995**, all responsible organizations (listed below) establish continuing education goals and encourage attendance in comprehensive seismic safety education programs for all design and construction professions.

Milestones
1. By **January 1993**, the California Building Officials, with the Seismic Safety Commission, seeks legislation to require the continuing education and certification of construction inspectors.
2. By **December 1993**, the California Building Officials, with the Seismic Safety Commission and International Conference of Building Officials, initiates a pilot study of typical major, moderate, and small building departments to determine the variety of qualifications and education needs of building inspectors and the adequacy of local government plan checking and inspection services.
3. By **December 1993**, the Association of General Contractors, California Council of the American Institute of Architects, American Society of Civil Engineers, and Structural Engineers Association of California, with the Seismic Safety Commission, take a random sample of contractors, architects, and civil and structural engineers to evaluate the knowledge of seismic safety and make recommendations on improving seismic safety practices through continuing education and changes in license laws.
4. By **December 1994**, responsible agencies recommend changes to their organizations' continuing education policies and seismic safety programs.
5. By **December 1995**, responsible agencies establish seismic safety continuing education goals and recommend legislation, if needed, to improve professional training and qualifications for seismic safety.

Resources Needed
State: Administration and coordination costs for the Seismic Safety Commission are expected to be 1/8 PY. Training for state employees should be given high priority.
Private: Costs are expected to be absorbed by nonprofit professional organizations.

Responsible Agencies
Lead Agencies:

Structural Engineers Association of California (Karrin Kuffel, Chairman, Technical Activities Committee)

California Building Officials (Raimar Schulyer, California Building Codes Institute)

California Council, The of American Institute of Architects (Micqui Miller, Professional Development)

Association of General Contractors (Bob Balliet, Seismic Safety Commission Liaison)

American Society of Civil Engineers (Eric Polson, Legislative Liaison)

Supporting Agencies:

Seismic Safety Commission (Fred Turner, Staff Structural Engineer)

Board of Registration for Professional Engineers and Land Surveyors (Darlene Stroup, Executive Officer)

California Board of Architectural Examiners (Steve Sands, Executive Director)

State Contractors' Licensing Board (David Phillips, Registrar)

Status
To be started.

Category 3

Emergency Response Management

Major earthquakes will continue to occur in California urban areas. Many buildings and other structures will be damaged, and many people will be injured or killed. This certainty demands that a high priority be placed on improving the abilities of emergency managers to respond to disaster needs. Because emergency response was successful in the Whittier Narrows and Loma Prieta earthquakes, there seems to be a general perception that California is ready to respond to major urban earthquakes, although evaluation of these emergencies clearly shows we are not.

Every earthquake points out the same flaws in our emergency management systems, but resources are not provided to make needed improvements. California's emergency responders at both the state and local levels have good plans and concepts for dealing with an earthquake, but they have not received funding for the communications equipment, training, and facilities needed to use these plans effectively. Local governments, facing severe budget shortfalls, have even reduced or eliminated their emergency management staffs. Immediately after an earthquake, it is too late to recruit needed personnel, provide training and put equipment and systems into operation. The interest in committing resources for earthquake preparations fades even more rapidly than the memory of the event.

Some improvements in earthquake preparations have been taking place. During the last five years the state has adopted an emergency response plan that describes catastrophic emergency operations for an event that exceeds the capability of the affected jurisdiction and its mutual aid partners, and the federal government has adopted a catastrophic disaster response plan that should ensure quicker flow of federal resources to areas affected by a disaster. Some communities are deeply concerned and are doing what they can to improve their own preparations, and the private sector is beginning to establish closer ties and partnerships with state and local governments.

Nevertheless, a major earthquake in an urban area will place demands on emergency managers and responders that will exceed their capabilities and resources. It will result in many times the number of damaged buildings and structures and casualties experienced in the Loma Prieta earthquake, and overtax mutual aid agreements between neighboring jurisdictions. The potential for saving lives and reducing property damage, especially from fire, can and must be increased by improving emergency management and response capability (trained personnel, facilities, and equipment) and response plans.

We are living on borrowed time. Unless local jurisdictions, supported by the State act, quickly establish an effective emergency management program with the trained professionals, equipment, and facilities to support the plans, catastrophic earthquakes will occur before California's emergency managers and responders are adequately prepared.

Emergency managers who responded to the Loma Prieta and Whittier Narrows earthquakes and emergency management experts who evaluated these responses identified the following objectives to guide the development of initiatives in this category:

- Install an improved and reliable means of communication for all levels of emergency managers.

  It has long been recognized that the ability of an emergency manager to react to quickly changing situations depends on the ability to communicate reliably with the damage assessors, resource suppliers, resource users, and all of the public support functions. Effective and reliable communications are the foundation of any successful emergency management system. To recognize and support the need for communications improvements, this requirement is identified as the first priority of Category 3.
- Adopt a common system of emergency management that is understood,

accepted, and used by all state, regional, and local emergency managers.

The use of a common management process by all levels of the emergency management system will create significant improvements in emergency operations and is the ultimate objective. An improved system will improve every emergency manager's ability to request and direct trained personnel effectively from any source including outside the damaged area.

- Provide professional certification and recognition for emergency managers.

  A management system complex and responsive enough to meet the interactive needs among the many levels of government demands professional managers. A certification program for emergency managers will recognize their professional emergency management skills and encourage all levels of government to select a qualified manager to run the system.

- Schedule regular exercises and training for full-time and augmentation personnel at all levels of the emergency management system.

  Emergency management professionals, elected officials and other managers will be no better than their training program. An integral part of any training program are exercises that test the individuals as well as the system. The first joint state/federal earthquake response exercise, held in Sacramento just prior to the Loma Prieta earthquake, proved extremely helpful to those who responded to the earthquake.

- Ensure that essential services facilities, such as emergency operations centers, fire and police stations, and communications facilities, are capable of operating after an earthquake.

Initiative 3.1
Improve Emergency Communications System

Successful emergency management depends on reliable communications for decisionmakers. Experience in the Loma Prieta earthquake highlighted the unreliability of the state's current emergency communications systems even though conventional landline and cellular telephone systems generally remained in operation. It demonstrated once again that reliable communications systems with effective backups are required to manage emergency responses in a disaster.

Emergency managers were able to use commercial cellular telephones after Loma Prieta. These systems continue to grow and their ability to provide emergency communications has been enhanced since 1989. However, damage to cellular antenna towers and rapidly increasing traffic on the cellular phone system could prevent it from providing effective communications in future earthquakes, unless an effective mechanism is established by the federal government to set call priorities.

In July 1989, the Office of Emergency Services developed a proposal for a satellite emergency communications system to form the backbone of a new, reliable primary state emergency system.

Objective
By December 1996, the Office of Emergency Services establishes a communications system for emergency management that is effective and reliable.

Milestones
1. By December 1992, the Office of Emergency Services decides what improvements may be needed to communicate with utility companies and meet medical requirements described in Initiative 3.5.
2. By December 1993, the Department of General Services updates the State Telecommunications Plan to include the satellite communications system.

Resources Needed
State: The satellite system costs are estimated as $13.65 million in capital outlay for equipment and ground sites and $1.04 million each year for operation and maintenance.
Local: The cost to provide communications network equipment for each county emergency operating center is included in the state total.

Responsible Agencies
Office of Emergency Services (Mike Guerin, Assistant Director, Response and Recovery)
California Emergency Services Association (Jim Bohon, President)
Seismic Safety Commission (J.F. Goodfellow, Planner)
Caltrans, Division of Maintenance (Dale TenBroeck, Chief, Office of Emergency Management)
Department of General Services, Division of Telecommunications (Fred Guston, Deputy Director)
Local Governments

Status
State: Funding to purchase this system was in the 1990/91 state budget but was frozen by an unexpected revenue shortfall.

References
1. Office of Emergency Services, *California Emergency Plan*
2. Seismic Safety Commission, *Earthquake Emergency Preparedness and Response,* SSC 90-08, 1990
3. Office of Emergency Services, SA-002 Satellite Communications Ground Terminals, Sept 1990
4. Government Code Section 8550, Emergency Services Act
5. Government Code Section 15277, Annual Report to the Legislature on State Telecommunications
6. Department of General Services, *9-1-1 Disaster Preparedness Report,* April 15, 1991

Initiative 3.2
Improve Emergency Management System

Differences in operating procedures and levels of proficiency among the state, regional and local levels of government makes it difficult to coordinate effective emergency response. This same problem has been reported after each of the last three damaging California earthquakes. A commonly accepted management system that is tested and used by all levels of government is needed to improve coordination of emergency responses.

Objective
By December 1996, the Office of Emergency Services requires all state agencies to use a standardized management system to coordinate emergency operations after earthquakes, and encourage local jurisdictions to use the same system.

Milestones
1. By December 1992, the Office of Emergency Services, in consultation with other interested parties, encourages use of a standardized emergency management system by all levels of government.
2. By December 1993, the Office of Emergency Services and the California Specialized Training Institute, in conjunction with local governments, evaluates existing training and establishes appropriate guidelines for future training using the standard system of emergency management.
3. By July 1994, the Office of Emergency Services and the California Specialized Training Institute offers training as required to meet the guidelines for emergency management established in Milestone 2. This training should be aimed at regional and local emergency managers and augmentation/volunteer personnel.

Resources Needed
State: The Office of Emergency Services may need additional resources to carry out this initiative. If local government is required to use this system to train, the state may incur state-mandate costs of about $3 million per year for four years. State costs include revisions to the State Emergency Plan.
Local: The costs to revise local plans and train personnel is about $12 million. Costs can be minimized if charges and training are integrated into ongoing programs.

Responsible Agencies
Office of Emergency Services (Eileen Baumgardner, Assistant Director, Plans)
Local Governments
California Emergency Services Association (Jim Bohon, President)
State Fire Marshal (David Walizer, Assistant State Fire Marshal)
Caltrans, Division of Maintenance (Dale TenBroeck, Chief, Office of Emergency Management)
California Peace Officers Association (Jack Gardner, POST)
Seismic Safety Commission (J.F. Goodfellow, Planner)
U.S. Army Corps of Engineers, Sacramento District, Emergency Management Division (Mark Verke, Chief EM Division)
Federal Emergency Management Agency, Region IX (Nick Nikas, Disaster Response)

Status
The Office of Emergency Services request for proposal #E1-91 is awaiting funding and the California Emergency Plan encourages the use of the Incident Command System and the ICS working groups.

References
1. Government Code Section 8550, Emergency Services Act
2. Office of Emergency Services, *California Emergency Plan*
3. Office of Emergency Services RFP #E1-91, Operational Area Emergency Information Management System
4. Seismic Safety Commission, *Earthquake Emergency Preparedness & Response,* SSC 90-08, 1990
5. Federal Emergency Management Agency, *Federal Natural Disaster Response Plan* (Draft), November 1990

Initiative 3.3
Improve Mutual Aid

Communities affected by major disasters need more than fire and law enforcement help. Although mutual aid agreements between local jurisdictions are frequently used to provide fire and police augmentation when needed, other kinds of resources also need to be made available when emergency demands exceed the capabilities of a damaged city or county.

The California Master Mutual Aid Agreement provides general procedures, but more specific agreements need to be developed to include assistance for all resources that may be needed for emergency response and recovery and resolve questions about liability.

Objective
By December 1994, the Office of Emergency Services establishes a system that allows local jurisdictions to get timely support from outside the damaged area for any governmental service that has been disabled or overextended.

Milestones
1. By December 1992, the Office of Emergency Services improves the mutual aid system and develops a process to provide augmentation for all government functions during an emergency.
2. By December 1993, the Office of Emergency Services and the California Specialized Training Institute provide training to local jurisdictions on procedures to access mutual aid to support all kinds of government functions following a disaster.

Resources Needed
State: Office of Emergency Services may require additional funding for the administrative costs to implement this initiative during the process of updating the State Emergency Plan.
Local: Local jurisdictions may incur minimal administrative costs to complete mutual aid agreements.

Responsible Agencies
Office of Emergency Services (Eileen Baumgardner, Assistant Director, Plans)
California Emergency Services Association (Jim Bohon, President)
Seismic Safety Commission (J.F. Goodfellow, Planner)
Local Governments

Status
Office of Emergency Services has prepared a *Mutual Aid Handbook* for printing in 1991 and a federal grant is pending to address common reporting and requesting procedures.

References
1. Government Code Section 8550, Emergency Services Act
2. Seismic Safety Commission, *Earthquake Emergency Preparedness and Response*, SSC 90-08, 1990

Initiative 3.4
Improve Medical Mutual Aid

Although there were few casualties in California's last three damaging earthquakes, the health care system demonstrated two weaknesses that must be overcome before major urban earthquakes: (1) the inability of the medical and emergency management systems to communicate quickly and effectively with each other and (2) the lack of widespread mutual aid agreements that can augment health care when and where needed.

Health care services are provided by many public and privately owned facilities, yet the system must operate as a whole to care for the injured. The medical emergency management system must be able to coordinate assistance and augment local providers as necessary. A commonly accepted system of support and financial agreements between the public and private medical providers is needed to improve the support of emergency responses. This mutual support must be integrated into the emergency management system through a communications system linking the managers of private and public medical services with the emergency managers.

Objective
By December 1993, the Emergency Medical Services Authority and the Office of Emergency Services improve the medical mutual aid system used by local, regional, and state agencies to coordinate emergency medical needs after an earthquake.

Milestones
1. By July 1992, the Emergency Medical Services Authority, in consultation with the Office of Emergency Services and the public and private medical providers, determines improvements needed in medical mutual aid, including communication needs.
2. By December 1992, the Office of Emergency Services incorporates appropriate changes in the State Emergency Plan.
3. By July 1993, the Office of Statewide Health Planning and Development incorporates appropriate changes in the State Health Plan.

Resources Needed
State: Absorbable administrative costs will cover this initiative. Emergency Medical Services Authority and the Office of Emergency Services may need funds to revise the State Emergency Plan. The costs to include medical communications in the state emergency communications system should be part of Initiative 3.1.

Responsible Agencies
Emergency Medical Services Authority (Calvin Freeman, Chief, Disaster Medical Services)
Office of Emergency Services (Eileen Baumgardner, Assistant Director, Plans)
Office of Statewide Health Planning and Development, Division of Health Products and Analysis (M.H. Gerould, Deputy Director)
Department of General Services, Telecommunications Division (Mark Phigler, Deputy Director)
Local Governments
California Emergency Services Association (Jim Bohon, President)
California Association of Hospitals and Health Services (Susan Harris, Vice President)
Seismic Safety Commission (J.F. Goodfellow, Planner)

Status
To be started.

References
1. Government Code Section 8550, Emergency Services Act
2. Office of Emergency Services, *California Emergency Plan*
3. Seismic Safety Commission, *Earthquake Emergency Preparedness & Response,* SSC 90-08, 1990
4. Health and Safety Code Section 439.5, State Health Plan
5. Government Code Section 15277, *Annual Report to the Legislature on State Telecommunications*

Initiative 3.5
Determine Emergency Medical Care Needs

Not enough is known about emergency medical care needs following major urban earthquakes or the extent to which acute-care hospitals will be available to provide assistance. Better estimates of the potential casualties and hospital facilities, available after earthquakes, are needed to provide guidance for planning alternative emergency medical strategies.

Many of the state's 490 acute-care hospitals were built prior to the 1973 Alquist Hospital Seismic Safety Act which requires new hospitals to remain functional after disasters. However, only a few of these older hospitals have been upgraded to comply with the new standards. Moreover, emergency medical treatment sources are rapidly expanding beyond acute care hospitals. Current trends toward decentralized medical specialty clinics and expanded out-patient services may offer emergency care for casualties not adequately incorporated in previous studies of the emergency medical system.

The needs for casualty care and the availability of treatment alternatives should be considered in Initiative 1.2 when establishing priorities and schedules for improving the performance of older hospitals, the state's medical mutual aid system, and other emergency plans.

Objective
By December 1994, the Emergency Medical Services Authority, the Department of Health Services, the Office of Emergency Services, and the Office of Statewide Health Planning and Development include provisions in appropriate plans to ensure that adequate emergency medical services will be available following a major urban earthquake.

Milestones
1. By July 1993, the Emergency Medical Services Authority, in consultation with Office of Statewide Health Planning and Development, Department of Health Services, and other interested organizations, completes a study to identify health care services needed after major urban earthquakes and recommends actions to provide post-earthquake emergency medical services.
2. By December 1994, the Office of Statewide Health Planning and Development incorporates the results of the Milestone 1 study into the State Health Plan and Initiative 1.2.
3. By December 1994, the Office of Emergency Services includes the results in state emergency planning guidance.

Resources Needed
State: Minor additional administrative costs should not require additional funding.

Responsible Agencies
Emergency Medical Services Authority (Calvin Freeman, Chief, Disaster Medical Services)

Office of Statewide Health Planning and Development (Gary Pettigrew, Deputy Director)

Department of Health Services (Harry Collins, Deputy Director, Public Health)

Office of Emergency Services (Eileen Baumgardner, Assistant Director, Plans)

California Association of Hospitals and Health Services (Susan Harris, Vice President)

Seismic Safety Commission (J.F. Goodfellow)

Kaiser Permanente (Marilee Miller, Disaster Contingency Planning)

Status
To be started.

References
1. Health and Safety Code Section 15020 *et seq.*
2. Seismic Safety Commission, *Earthquake Emergency Preparedness and Response,* SSC 90-08, 1990
3. Building Safety Board, *California at Risk* Milestone 4 Report, December 1990
4. Office of Statewide Health Planning and Development
5. Health and Safety Code Section 1797.121
6. Health and Safety Code 439.3, *State Health Plan*
7. Office of Emergency Services, *California Emergency Plan*

Initiative 3.6
Improve Shelter Planning

The last three damaging California earthquakes demonstrated the need to plan and designate short-term and long-term shelters, improve the ability of shelter managers to assist ethnic groups and economically disadvantaged, and otherwise improve shelter operations.

Cities and counties need to identify shelters in advance. During the Loma Prieta quake, about 12,000 people left homeless swamped the shelters. Eighteen months after the quake, little long-term and low-income housing was replaced; many were still living in temporary housing. The large number of people requiring long-term shelters was not anticipated. Local governments must be ready for them next time.

Objective
By December 1992, the Office of Emergency Services, in consultation with the listed agencies and organizations, improves shelter planning to designate short- and long-term shelters and temporary housing, provide liaison and outreach services for ethnic groups and encourage training of additional shelter managers.

Milestones
1. By July 1992, the Department of Social Services, in consultation with the Department of Housing and Community Development, the American Red Cross, Federal Emergency Management Agency and Office of Emergency Services, begins developing structure, policies and guidance to provide long- and short-term shelters, temporary housing, and liaison services.
2. By December 1993, the Office of Emergency Services includes this guidance in the state emergency plan.

Resources Needed
State: Administrative costs should be part of the overall disaster preparation and response services of the Department of Social Services and Office of Emergency Services.

Local: Jurisdictions may need additional support from Office of Emergency Services for training and local emergency planning assistance.

Responsible Agencies
Department of Social Services (Lee Sapaden, Manager, Disaster Response Services)
Office of Emergency Services (Eileen Baumgardner, Assistant Director, Plans)
Department of Housing and Community Development (Dan Pennington, Chief, Division of Community Affairs)
American Red Cross
Salvation Army
Federal Emerg. Management Agency (David Vargo, Volunteer Services, Region IX)
Seismic Safety Commission (J.F. Goodfellow, Planner)
California Emergency Services Association (Jim Bohon, President)

Status
Some of the agencies involved have held preliminary meetings.

References:
1. Government Code Section 8550, Emergency Services Act
2. State Emergency Plan, Annex G
3. Seismic Safety Commission Report, *Earthquake Emergency Preparedness & Response,* SSC 90-08, 1990
4. State FY 90/91 budget item 8940-001-001
5. Health and Safety Code Section 34070
6. American Red Cross, Northern California Earthquake Relief and Preparedness Project

Initiative 3.7
Improve Professional Qualifications of Emergency Managers

Emergency managers urgently need to become better qualified to meet the challenge of providing efficient and effective emergency management. Education, awareness of current issues and concerns, and knowledge of modern management techniques are the most effective tools a manager can use when responding to and recovering from natural and human-caused disasters.

The professional standing of emergency managers is not recognized formally because emergency management only recently was seen as a speciality. Preparation for this profession is limited by the absence of an academic curriculum and courses in universities. Moreover, there are no continuing education requirements that assure those in the profession stay abreast of advances in this rapidly changing field. The lack of recognition for professional qualifications makes it difficult for local officials and private sector managers to judge professional qualifications when selecting an emergency manager. The Federal Emergency Management Agency, the National Coordinating Council on Emergency Management, and the California Emergency Services Association have recognized this problem. These organizations are currently developing professional certification programs for emergency managers.

Objective
By **December 1996**, the Office of Emergency Services improves the use of qualified emergency managers by recognizing and encouraging certification programs.

Milestones
1. By **July 1993**, the Office of Emergency Services holds a conference of all concerned organizations to develop and recognize a certification program for emergency managers.
2. By **December 1993**, the California Emergency Services Association and the National Coordinating Council On Emergency Management provides certification for emergency managers.
3. By **December 1994**, the Office of Emergency Services provides guidance to local governments on the qualifications of emergency managers and determines the incentives and requirements needed to encourage the employment of certified professionals.

Resources Needed
State: Minor added costs for the Office of Emergency Services to meet with local and statewide emergency planning councils.
Local: Expected to be negligible since professional certification can be done via personnel policies over several years.
Private: Minor costs for professional organizations.

Responsible Agencies
California Specialized Training Institute (John Mirolla, Director)
California Emergency Services Association (Jim Bohon, President)
National Coordinating Council On Emergency Management (Elizabeth Buzzerd Armstrong, Executive Director)
Seismic Safety Commission (J.F. Goodfellow, Planner)
League of California Cities
County Supervisors Association of California

Status
A certification program was started by the California Emergency Services Association. CESA is preparing to offer a professional certificate in emergency management.

The National Coordinating Council On Emergency Management is funded by the Federal Emergency Management Agency to prepare a national certification program expected to begin in 1993.

References
1. California Emergency Services Association, Certified Emergency Management Professional Program
2. National Coordinating Council On Emergency Management, Phase III, National Certification Program

Initiative 3.8

Reduce the Risk of Hazardous Materials Release in Earthquakes

Earthquakes cause hazardous material releases capable of endangering people nearby as well as the public over a large area. A chlorine leak after the Whittier Narrows earthquake created a toxic cloud over portions of Santa Fe Springs. The Loma Prieta earthquake damaged two petrochemical plants in Richmond miles from the epicenter, caused spills in laboratories at Stanford and Berkeley, and released 10,000 pounds of anhydrous ammonia inside a Watsonville warehouse. This complicates emergency response operations and demonstrates that emergency responders must anticipate hazardous material emergencies after earthquakes.

Existing hazardous materials programs do not deal uniformly with hazards caused by earthquake performance of new or existing buildings, or facilities located in areas of potential ground failure. Current programs address the daily problems of spills and leaks, single incident emergencies. Local governments, usually the fire department and private sector teams can only deal with a limited number of isolated releases at one time. Earthquakes can cause a number of simultaneous hazardous material releases, at the time when the hazardous materials emergency responders are already overwhelmed with other incidents.

Hazardous materials programs should be coordinated with state and federal seismic safety programs to identify hazardous facilities, set design criteria, and identify areas of geologic hazards so that facilities containing quantities of hazardous materials sufficient to pose a risk to more than immediate handlers and complicate emergency response are adequately prepared.

Those responsible for the manufacture, transportation, storage, use and disposal of hazardous materials of a nature and quantity that can cause emergency response concerns, should consider earthquakes in the design, retrofit and operation of their facilities.

Federally owned or operated activities in Seismic Zone 4 should use the same standards as state and local jurisdictions require for construction, emergency planning and response.

Objective

By **December 1996**, the Chemical Emergency Planning and Response Commission amends regulations for the manufacture, transportation, storage, use and disposal of materials of a nature and in quantities capable of causing life threatening incidents to minimize the release of hazardous materials in earthquakes.

Milestones

1. By **December 1992**, the Seismic Safety Commission recommends to the Chemical Emergency Planning and Response Commission (CEPRC) actions to improve seismic safety.
2. By **December 1992**, the Office of State Fire Marshal adopts Article 80 of the Uniform Fire Code regarding standards for hazardous materials storage.
3. By **July 1993**, the Office of Emergency Services includes actions necessary to improve the hazardous materials safety of responders and the public during earthquakes in appropriate guidance to emergency managers.
4. By **July 1994**, owners begin improving the seismic resistance of their buildings and hazardous materials storage systems that contain quantities of hazardous materials sufficient to cause a significant threat to public safety.
5. By **December 1995**, the Seismic Safety Commission and the Chemical Emergency Planning and Response Commission establishes a process to encourage federal facilities that use, store, transport or dispose hazardous materials to meet California seismic safety standards.

Resources Needed

State: The Seismic Safety Commission will require 1/2 PY and $20,000 to prepare the report in milestone 1 and to work with the building code agencies.
Local: An increase in local government expenses is not expected since regulatory and response programs are already in place.
Private: Data is not available to project the cost to mitigate the risk of facilities considered potentially hazardous in an earthquake.

Responsible Agencies

Chemical Emergency Planning and Response Commission (Richard Andrews, Chair)
Office of Emergency Services (Paul Penn, Title III, SARA, Program Manager)
Office of the State Fire Marshal (Manny A. Muniz, Deputy State Fire Marshal)
California Environmental Protection Agency (Glenn Brank, Deputy Director, Communications)
Seismic Safety Commission (J.F. Goodfellow, Planner)
U.S. Army Corps of Engineers, Sacramento District (Mark Verke, Chief, Emergency Management Division)
Sacramento Air Logistics' Center, Directorate of Environmental Management McClellan Air Force Base, Sacramento (Paul Brunner, Director)

Status

The Office of State Fire Marshal is holding hearings to adopt Article 80 of the 1991 Uniform Fire Code. Further efforts remain to be started.

References

1. State Hazardous Materials Contingency Plan
2. 1991 Uniform Building Code
3. Superfund Amendments and Reauthorization Act of 1986
4. Title 42 of U.S. Government Code, Section 11001 *et seq.*
5. California Health and Safety Code, Chapter 6.95
6. Title 19 of California Code of Regulations
7. National Fire Protection Association, *Loma Prieta Earthquake Emergency Response and Stabilization Study*
8. Association of Bay Area Governments, *Hazardous Materials Problems During Earthquakes: A Guide to Their Cause and Mitigation*
9. Association of Bay Area Governments, *Manual of Techniques for Preventing or Controlling Toxic Gas Releases in Earthquakes* (Draft), June 1991

Initiative 3.9

Improve Earthquake Performance of Telephone Systems

Following earthquakes, a flood of essential and nonessential calls overload telephone systems. Although performance of telephone equipment and facilities was acceptable in the Whittier Narrows and Loma Prieta earthquakes, partly because of retrofitting programs, the heavy volume of calls still disrupted essential services telephone systems. The near failure of a critical telephone building in Oakland during the Loma Prieta earthquake confirmed the possibility of even more expensive and disruptive failures of communication systems.

Cellular telephones are an emergency communication alternative that served emergency responders following the Loma Prieta earthquake and smaller disasters since then. Mobile and transportable phones make communication from disaster scenes possible. But they can become saturated during an emergency unless a priority setting mechanism is set up by federal regulators.

System management techniques can address overloading of these systems. For example, systems can give essential phone calls priority, limit the length of nonessential calls, and provide a "voice mail system" out of the damaged area. The Federal Communications Commission is investigating a Telecommunications Service Priority system that would help restore service after a disaster.

Objective

By **December 1996**, the Public Utilities Commission improves telephone systems' ability to withstand earthquake forces, maintain essential communication capabilities, and improve overall communications using enhanced disaster procedures.

Milestones

1. By **January 1992**, the Office of the State Architect will establish a cellular telephone task force to develop regulations and standards to ensure the maintenance of cellular telephone service during and after earthquakes.
2. By **January 1994**, the Seismic Safety Commission, with other responsible agencies, proposes legislation authorizing utilities to implement procedures that mitigate overloads and ensure access for essential communications.
3. By **January 1995**, the Seismic Safety Commission, with other responsible agencies, proposes legislation to establish a hazard mitigation plan for essential communication systems.
4. By **December 1996**, and annually thereafter, the responsible agencies report to the Public Utilities Commission on the progress of the above mitigation program.

Resources Needed

State: Additional administrative costs required by this initiative should be absorbed by the agencies involved.

Responsible Agencies/Organizations

Public Utilities Commission (Richard Smith, Telephone Communications)

Private telephone and cellular utilities

Seismic Safety Commission (J.F. Goodfellow)

Office of Emergency Services (Mike Guerin, Assistant Director, Response and Recovery)

Department of General Services, Division of Telecommunications (Fred Guston, Deputy Director)

Office of the State Architect, Essential Services Act Advisory Board (H. Patrick Campbell, Chief Structural Engineer)

Status

1991 legislation requires a task force of the Seismic Safety Commission to develop performance standards for cellular systems.

References

1. Department of General Services, 9-1-1 Disaster Preparedness Report, 1991
2. Federal Emergency Management Agency and National Institute of Standards and Technology, A plan to develop lifeline earthquake engineering standards
3. Federal Communications Commission Telecommunications Service Priority System
4. Chapter 813, Statutes of 1991

Category 4
Disaster Recovery

Predisaster recovery planning is as much mitigation planning as is structural retrofit planning for buildings. The longer recovery from a damaging earthquake takes, the greater its human and economic toll. The major responsibility for managing post-earthquake recovery and reconstruction belongs to local governments and the private sector. This responsibility can be an overwhelming but should not be unanticipated. An earthquake's impact on the community changes policy agendas and governing priorities for at least several years, and local decisions are often constrained by the limitations imposed by federal and state disaster assistance programs. But these problems can be reduced through advance planning.

The longer-term and more difficult governmental issues that emerge once the initial emergency response period is over—economic development, land use, housing, redevelopment and building standards—are similar to many with which local officials deal regularly; however, the environment in which they must address them changes radically. Public safety concerns and business pressures for a quick return to "normal" compress the time frames for making decisions. Yet, with predisaster planning and organizing, the systems needed to make the recovery process work can be coordinated.

Like the first five-year program, this second five-year program emphasizes the need for preevent earthquake recovery planning by local jurisdictions, state agencies and university systems. Experience shows that communities that consider these problems in advance suffer far less economic and social disruption in an earthquake's aftermath. Effective recovery planning is essential to expedite reconstruction, and is especially important to reassure the business community so it continues to provide goods and services—and jobs. State and federal aid can help, but only the community itself can do the planning, provide the help, and establish the climate that encourages community and business recovery. Moreover, through advance planning a community can gain a better understanding of the need to reduce hazards and develop a recovery framework that includes community leaders in business, housing, and social services and neighboring jurisdictions.

There are three important aids to assist local jurisdictions in preevent planning for post-disaster recovery and reconstruction.

- *The Disaster Recovery and Reconstruction Act of 1986* authorizes local governments to do advance recovery and reconstruction planning and allows for the creation of "standby" local reconstruction authorities.
- *Preearthquake Planning for Post-earthquake Rebuilding* (PEPPER) (William E. Spangle, Ed.), funded by the National Science Foundation, examines the many elements affecting the feasibility and nature of the whole planning process for rebuilding.
- *Recovery and Reconstruction Planning Guidelines for Local Governments,* recently published by the Southern California Earthquake Preparedness Project (SCEPP), is the culmination of a multiyear effort drawing on expertise from both public and private sectors, including officials directly involved in recovering from the Whittier Narrows and Loma Prieta earthquakes. The guidelines address critical issues such as rehabilitation and rebuilding, local business recovery, housing displaced persons and families, public facilities and services, and recovery financing.

The state, of course, has a major stake in earthquake recovery. It is responsible for its own buildings and programs and for furnishing and administering disaster aid and a host of other programs such as workers compensation that aid earthquake victims. The state must work to improve coordination and efficiency of existing aid programs that assist local governments, businesses, and citizens to recover from earthquakes.

Not enough is known about the effects of a major earthquake on California's state government and economy to predict effects with any precision, but it is clear that they will be severe, and it is also clear that state government must plan for its own recovery

from such an earthquake—repair of infrastructure and its own buildings, and disruption of its operations. The Commission's report *Policy on Acceptable Levels of Earthquake Risk in State Buildings* (SSC 91-1) recommends steps that each agency should take to manage its earthquake risk and includes a timeline that would meet the Legislature's goal of reducing California's earthquake risks significantly by the year 2000.

The objectives of the initiatives in this category are to:

- Encourage California cities and counties to prepare and update plans for community recovery and reconstruction after a major earthquake.
- Determine how local, state and federal governments will be affected by a major earthquake to mitigate effects to the extent possible and manage the remaining problems.
- Develop a practical program to preserve unique historic and architectural resources damaged in an earthquake.
- Improve state and federal disaster assistance and its delivery.
- Develop options for replacing housing, especially low-cost housing.

Initiative 4.1
Implement Recovery Guidelines

Experience with damaging earthquakes in California clearly demonstrates the difference between recovery and economic impacts from local seismic events that recur frequently and the infrequent regional disasters for which impacts continue for years. During the first five-year program, several basic tools were developed to help local governments plan for post-earthquake recovery and reconstruction. Improved use of this recovery guidance and its implementation must be encouraged since competing demands for limited government resources continue to delay recovery planning for future disasters.

Objective
By **January 2000**, local jurisdictions complete planning actions to make recovery from natural disasters more effective and timely.

Milestone
1. By **December 1993**, the Bay Area Regional Earthquake Preparedness Project completes a resource manual to help jurisdictions recover from earthquakes.
2. By **December 1994**, the Office of Emergency Services, using the Bay Area Regional Earthquake Preparedness Project and the Southern California Earthquake Preparedness Project, initiates workshops to train local government officials in recovery planning.
3. By **December 1994**, the Office of Emergency Services determines potential mutual aid needs to help local jurisdictions recover.
4. By **December 1994**, the Office of Emergency Services develops a recovery and reconstruction planning module and includes it in training programs given at the California State Training Institute.

Resources Needed
State: $125,000 per year for three years ($375,000 total) for the Office of Emergency Services to develop training materials and present workshops.
Local: Unknown.

Responsible Agencies
Office of Emergency Services (Cindy Shamrock, Chief Deputy Director, and Paul Flores, Deputy Director)
Bay Area Regional Earthquake Preparedness Project (Richard Eisner, Director)
Southern California Earthquake Preparedness Project (Gilbert Najera, Director)
Economic Development Commission (Debbie McConville, Deputy Director)
Seismic Safety Commission (J. F. Goodfellow, Planner)
State Historical Building Safety Board (Jud Boies, Executive Officer)
County Supervisors Association of California
League of California Cities
Community Redevelopment Agencies Association

Status
The recovery guidelines developed by the Southern California Earthquake Preparedness Project can serve as a basis for this effort.

References
1. Government Code Section 8874.5 *et seq.*
2. US General Accounting Office, *Disaster Assistance*, March 1991
3. National Science Foundation, *Preearthquake Planning for Post-earthquake Rebuilding*
4. Office of Emergency Services, *Earthquake Recovery and Reconstruction, Planning Guidelines for Local Governments*, May 1991
5. Governor's Emergency Task Force on Earthquake Preparedness, *Long Range Recovery and Reconstruction*, August 1981
6. City of Los Angeles, Draft Recovery and Reconstruction Plan, May 1991
7. Stanford University, *Earthquake Risk Management Commission: Final Report*, October 1990
8. Public Law 100-707, The Stafford Act

Initiative 4.2
Initiate a State Recovery Plan

Two years after the Loma Prieta earthquake, recovery still has far to go. Many major state agency highway and building reconstruction projects are barely started or have only been scheduled for future years. Agencies affected by building closures had to relocate and reestablish operations during a period when their services were needed. A variety of impediments to timely, effective recovery are apparent. These include the lack of plans to resume providing state services and practical decision making mechanisms to deal with damaged buildings and bridges. State government itself must begin planning for its own business resumption, recovery and reconstruction. State agencies must identify buildings and facilities likely to be damaged by earthquakes and adopts plans to guide the restoration of services after major earthquakes.

Objective
By **January 2000,** all state agencies and institutions that has facilities at risk in earthquakes adopt business resumption and recovery plans.

Milestones
1. By **December 1993**, the Seismic Safety Commission designs a briefing or series of briefings on California's earthquake risk, risk management, and the value of planning for earthquake recovery by each state agency.
2. By **December 1994**, the Seismic Safety Commission arranges for this briefing or series of briefings to be presented to senior Administration and budget officials.
3. By **July 1995**, the Administration assigns a control agency to oversee agency recovery planning.

Resources Needed
State: The plan can be developed without additional funding.

Responsible Agencies
Seismic Safety Commission (Brian Stoner, Legislative Liaison)
Department of General Services
Department of Finance
Office of Emergency Services (Cindy Shamrock, Chief Deputy Director)
University of California, Office of the President
California State University System, Office of the Chancellor

Status
To be started.

References

1. Seismic Safety Commission Report, *Policy On Acceptable Levels of Earthquake Risk In State Buildings,* SSC 91-01, 1991
2. Seismic Safety Commission Report, *Report to Governor George Deukmejian on Executive Order D-86-90,* SSC 90-06, 1990
3. Governor's Emergency Task Force on Earthquake Preparedness, *Long Range Recovery and Reconstruction,* August 1981
4. Southern California Earthquake Preparedness Project, *Earthquake Recovery and Reconstruction, Planning Guidelines for Local Governments*, May 1991
5. Stanford University Earthquake Risk Management Commission: *Final Report,* October 1990
6. City of Los Angeles, *Draft Recovery and Reconstruction Plan*, May 1991

Initiative 4.3
Estimate Economic and Governmental Impacts

When a major earthquake occurs in one of California's urban areas, it may cause great loss of life and will cause immense damage to the economy of the affected region and the entire state. Businesses and individuals will be severely affected; local and state governments will be hard pressed to deliver normal services, let alone the disaster aid the stricken area will require.

Although the Loma Prieta earthquake epicenter was in a rural area, it reduced property tax assessments by $465 million, which in turn decreased the property tax revenues of nine counties by $4.7 million annually. Sales taxes and other government revenues were also affected. A major urban-area earthquake will cause economic losses and reduce tax revenues and productivity, and increase costs for disaster aid and recovery funding, repair of government and private facilities, and resumption of government operations. State and local governments, businesses, and individuals need to prepare appropriate precautions and adopt suitable management strategies to deal with the financial aftermath of such an earthquake.

A study is needed to identify the range and types of losses and the probable consequences of such an earthquake on the economies of the state's major urban areas and resulting impacts on state and local government operations. It should make recommendations for avoiding, ameliorating, and recovering from them to provide a basis for state and local government, businesses, and individuals to develop plans and strategies to reduce earthquake impacts.

Objective
By **December 1995**, the Seismic Safety Commission makes available to local and state governments a study that focuses upon the probable economic consequences of a major urban earthquake and identifies and recommends appropriate strategies and policy options for local and state governments.

Milestones
1. By **December 1993**, the Seismic Safety Commission convenes an advisory committee to describe the scope of the study and procedures for implementing it.
2. By **July 1994**, the Seismic Safety Commission submits the final study, including policy recommendations, to the Governor and the Legislature, and distributes copies to local government agencies.
3. By **January 1996**, the Seismic Safety Commission sponsors legislation needed to implement the study's recommendations.

Resources Needed
State: $250,000 for study

Responsible Agencies
Seismic Safety Commission (Brian Stoner, Legislative Liaison)
Department of Finance
Business, Transportation and Housing Agency
Department of Insurance (name, position)
Office of Emergency Services (Cindy Shamrock, Chief Deputy Director)

Status
1991 Legislation (SB 231, Alquist) is pending.

References
1. Governor's Emergency Task Force on Earthquake Preparedness, *Long Range Recovery and Reconstruction*, August 1981
2. The Earthquake Project, *Catastrophic Earthquakes: The Need to Insure Against Economic Disaster*, March 1989

Initiative 4.4
Develop Rubble Disposal Strategy

Major earthquakes produce large amounts of debris from damaged structures. Many different methods are available for disposal. In San Francisco, after the 1906 earthquake, much of the rubble was pushed into the bay; some, unfortunately, became the uncompacted fill on which the Marina District, which suffered heavy damage in the 1989 Loma Prieta earthquake, was built. Rubble from that earthquake in the City of Santa Cruz amounted to the equivalent of two years' worth of solid waste in the city's landfill.

Modern engineering practice considers loose, nonengineered fill to lack strength and stability for future construction, and recent environmental studies on water quality raise concerns that rubble could include hazardous materials and contaminate ground water and bays. There are limits on the type of rubble that can be recycled and few land fills are available for this use.

Recovery can be expedited, and engineering and environmental concerns reduced, by determining the most practical rubble disposal procedures prior to a major earthquake.

Objective
By **December 1993**, the San Francisco Bay Conservation and Development Commission prepares a model plan and implementation strategy for the removal and disposal of rubble after a future earthquake.

Milestones
1. By **January 1992**, the San Francisco Bay Conservation and Development Commission develops a coordinated multiagency feasibility study plan.
2. By **December 1992**, the San Francisco Bay Conservation and Development Commission presents results of the multiagency study and recommendations for action to the Seismic Safety Commission.
3. By **December 1993**, the Seismic Safety Commission incorporates the recommendations into the California Earthquake Hazards Reduction Program.
4. By **December 1994**, the Seismic Safety Commission distributes to local governments a model plan and manual for removal, disposal and reuse of earthquake rubble.
5. By **December 1996**, the county governments develop strategies for the removal, disposal and reuse of rubble and incorporates these strategies in land use plans.

Resources Needed
State: San Francisco Bay Conservation and Development Commission will require 1/4 PY to complete these actions.

Responsible Agencies
San Francisco Bay Conservation and Development Commission (W. Travis, Deputy Director)

Seismic Safety Commission (Richard McCarthy, Geologist)

US Army Corps of Engineers (Hugh Converse, Engineer)

Status
Funding and personnel are not available at this time. To be started.

References
1. California Coastal Act of 1976, California Government Code Section 3000 *et seq.*
2. McAteer Petris Act, California Government Code, Title 7.2

Initiative 4.5
Provide Post-Earthquake Housing

Replacing low-income housing after earthquakes is a significant recovery problem not adequately addressed by current programs. Even though the Loma Prieta earthquake was in a rural area, it damaged over 23,000 housing units in Santa Cruz, Alameda, and San Francisco counties. Nearly two years later, most still have not been replaced. Over 14,000 applications for temporary housing were approved. The situation will be worse after an urban area earthquake. A study of the effects of a great earthquake in southern California estimated that those made homeless could be as high as 130,000. Because of the type, age, and location of housing, a large share of these victims will be low-income persons.

The state's seismic retrofit programs administered by the Department of Housing and Community Development are focused on low-income, multifamily unreinforced masonry buildings, but funds are limited. Housing rehabilitation programs also have limited funding. Together these programs will not solve the problem caused by the vulnerability of the housing stock to earthquakes.

The problem is complicated because different agencies are responsible for long-term shelters, for temporary housing, and for hazard mitigation. Cooperation is needed to reduce housing losses and be ready to replace low-income housing that is damaged in future. Interim housing is a concern for agencies with both long-term sheltering and replacement housing responsibilities. The American Red Cross, local governments, Office of Emergency Services, Department of Housing and Community Development, Federal Emergency Management Agency and U.S. Housing and Urban Development Department all have significant responsibilities that need clarification.

Objective
By **December 1996**, the Department of Housing and Community Development develops an action plan and implementation strategy to retrofit or replace existing multiunit housing in buildings likely to fail and to provide for replacement housing after an earthquake.

Milestones
1. By **July 1992**, the Department of Housing and Community Development, with the Office of Emergency Services, the Bay Area Regional Earthquake Preparedness Project, and the American Red Cross, assesses post-earthquake housing issues and identifies organizations that have responsibility for low-income housing retrofit as well as post-earthquake sheltering and replacement.
2. By **December 1993**, the Department of Housing and Community Development determines options, including possible financing mechanisms, for low-income housing retrofit and how to provide post-earthquake low-income housing.
3. By **December 1995**, the Department of Housing and Community Development and Office of Emergency Services recommend menas for replacing low-income housing.
4. By **December 1996**, the Department of Housing and Community Development recommends procedures for more low-income housing retrofitting and financing.

Resources Needed
State: The activities should be done using existing resources.

Responsible Agencies
Department of Housing and Community Development (Dan Pennington, Chief, Division of Community Affairs)
Office of Emergency Services (Paul Flores, Deputy Director)
Association of Bay Area Governments (Gary Binger, Planning Director)
Federal Emergency Management Agency, Region IX (Nick Nikas, Disaster Response)
American Red Cross
League of California Cities
Seismic Safety Commission (J.F. Goodfellow)

Status
BAREPP is conducting a workshop on post-earthquake shelter and housing policy issues.

References
1. Seismic Safety Commission, *Loma Prieta's Call to Action*, SSC 91-06, June 28, 1991
2. Association of Bay Area Governments, *Blueprint for Bay Area Housing*, May 1990

Category 5
Research and Information/ Education

The tremendous risk to life and property in California provides a powerful incentive to press ahead in filling the gaps in knowledge of earthquake causation, seismicity, resistant structural design, hazard mitigation, and in social, behavioral, and policy issues. Earthquake safety progress in California depends on our ability to learn more about earthquakes and to apply that knowledge more effectively. This requires a comprehensive research program that is focused on the state's most critical seismic safety needs. A coordinated public information/education program is required to make sure that California's citizens can act to reduce their own earthquake risks, and will support needed programs at both the state and local levels.

Research

Research is essential to understanding earthquake hazards and finding ways to mitigate them. Research is an important component of many initiatives in this five-year program, especially in the areas of engineering, architecture and earth sciences. Equally important is translation of research results into a form that will be used. Transfer of this new knowledge is necessary to reduce earthquake hazards and improve seismic policy, and to make these results available to all who need them. Emerging technologies must also be explored because of their potential contribution in reducing costs and increasing effectiveness of earthquake safety.

Greater understanding of the causes and effects of earthquakes will assist public and private entities in carrying out their seismic safety responsibilities. A comprehensive program of research will find reliable and cost-effective strategies for dealing with existing hazardous structures, design safer buildings, make better land-use decisions, and conduct better emergency response operations. Research results can find ways to encourage individuals and businesses to plan for earthquakes, establish economical recovery strategies, and improve recovery planning and operations. Research can advise persons how to avoid injury during earthquakes and medical professionals how to better prepare for and respond to those who are injured.

This objectives of the initiatives in this category are to:

- Learn how to achieve defined levels of earthquake performance in facilities and engineered structures.
- Find economical means to reduce earthquake losses.
- Learn how to maintain or rapidly restore the function of infrastructure systems during and after earthquakes.
- Learn how to make earthquake emergency response more effective.
- Learn how to rapidly restore damaged communities following an earthquake.
- Improve the use of knowledge gained through research and experience.
- Develop methods to motivate people of varied cultural backgrounds to prepare for earthquakes, and to communicate response and recovery information to them.
- Provide adequate facilities for research and development and to validate engineering practices and proof-test earthquake mitigation devices.

Information/Education

Public information and education are critical to successful implementation of hazard reduction plans. Individuals, businesses, and private organizations are responsible for their own hazard mitigation actions. No one else—not the state government, the federal government, or local governments—can do it for them. But these individuals and organizations will act only if they know how to take reasonable precautions to reduce hazards, to respond to emergencies, and to recover more easily. Education that leads to this understanding of the earthquake risk can provide the basis for public and political support for expensive actions necessary to prepare for earthquakes.

Providing information to the media is of particular importance. State and local government agencies have a special responsibility to provide accurate, helpful

information that can be given out by the media after a damaging earthquake. Emergency response organizations need to stress development of an ongoing media relationship to develop an understanding of news organizations' disaster response problems and parameters.

Because so much information must be shared by so many organizations, a coordinated program is needed to focus on providing high-priority messages to those who need and can best use it. This would involve state agencies such as the Office of Emergency Services, the Southern California Earthquake Preparedness Project, the Bay Area Regional Earthquake Preparedness Project, the Department of Conservation, and the Seismic Safety Commission; volunteer organizations such as the Red Cross, the Salvation Army, and the United Way; federal agencies such as the Federal Emergency Management Agency and the U.S. Geological Survey; and private businesses such as Pacific Bell, which publishes earthquake information in the front of their telephone books. These organizations should decide who needs earthquake information, what information is needed, how it should be delivered, and how it should be paid for.

Objectives

- Obtain the information needed to reduce losses from future earthquakes by carrying out an earthquake research plan that focuses limited earthquake research resources on priorities based on seismic safety needs.
- Assure the information reaches businesses, private and public organizations, and individuals of varied cultural backgrounds in a media and form that will help them take appropriate actions before, during and after earthquakes to reduce deaths, injuries, and disruption.

Initiative 5.1
Implement An Earthquake Research Plan

Reducing California's seismic hazards significantly by the year 2000, and setting the stage for continued progress afterward, requires a coordinated research effort in engineering and architecture, earth sciences, and social sciences and public policy. Needed are a strengthened understanding of the nature, causes and prediction of earthquakes; better ways to mitigate structural and geotechnical hazards; improved understanding of social and economic impacts of earthquakes, and methods of reducing adverse effects; and better strategies and policies for emergency response and recovery. In addition, the development and implementation of new technologies should be encouraged wherever they hold promise of helping with seismic hazard reduction.

To accomplish this goal, the Seismic Safety Commission must develop a five-year Earthquake Research Plan for the State of California, and work in cooperation with both researchers and practitioner-users to implement the plan and put the research to work in reducing earthquake hazards. The Earthquake Evaluation Conference required by SB 1835 (Chapter 782, Statutes of 1990) will help develop a strategy for earthquake research, with particular attention to investigations likely to bring about a significant reduction in loss of life and property damage, and to promote more rapid economic recovery from earthquakes. The findings of the Earthquake Research Evaluation Conference will be incorporated in the plan.

Objective
By **December 1992**, the Seismic Safety Commission adopts an Earthquake Research Plan that: (1) enables the state to coordinate, identify and fund priority earthquake research to best meet the state's seismic safety needs; (2) identifies for federal, state, and local governments and private industry those areas of earthquake research where outside funding assistance is most needed; and (3) assists in review of research proposals.

Milestones
1. By **April 1992**, the Seismic Safety Commission reviews and adopts a "Draft Earthquake Research Plan."
2. By **September 1992**, the Seismic Safety Commission, in collaboration with the California Council on Science and Technology, the Division of Mines and Geology, and the Office of Competitive Technology, holds an Earthquake Research Evaluation Conference. Participants in this conference will review, critique, and revise the draft research plan prepared by the Seismic Safety Commission.
3. By **December 1992**, the Seismic Safety Commission adopts a final Earthquake Research Plan and begins efforts to seek funding, through legislation and/or other means, to carry out the plan.

Resources Needed
State: The Seismic Safety Commission will absorb the cost of preparing the plan and will seek $25,000 for the evaluation conference. Research funding needs will be included in the plan.

Responsible Agencies
Seismic Safety Commission (Richard McCarthy, Geologist)
Division of Mines and Geology (James F. Davis, State Geologist)
California Council on Science and Technology (Dr. Donald Shields, Executive Director)
Office of Competitive Technology (Max Cheeseman, Contracts and Grants Manager)
California Universities for research in earthquake engineering
University researchers in earth sciences
Research Universities; Federal Agencies; Private Industry; Local Government

Status
Preparation of the Earthquake Research Plan and the Earthquake Evaluation Conference is underway.

References
1. Chapter 782, Statutes of 1990
2. Chapter 901, Statutes of 1991

Initiative 5.2

Establish a Coordinated Earthquake Information Strategy

Information on seismic risk, hazard mitigation, emergency preparations and response and recovery are at present provided by a variety of federal, state, and private organizations. Not all the information provided is accurate, or meets public and business needs. A particular need is to ensure that the media are prepared and equipped to give the public the information it needs immediately following earthquakes regarding how to deal with injuries, damage and debris; likelihood of aftershocks; and the status of services, transportation, etc.

Objective

By **December 1994**, responsible agencies identified through a Memorandum of Understanding will create a strategic plan for a unified public information campaign for state agencies and other cooperating organizations, and a process to develop and approve materials that are accurate, up to date, and consistent among organizations.

Milestones

1. By **July 1992**, prepare a Memorandum of Understanding among Office of Emergency Services, Division of Mines and Geology, American Red Cross, USGS, Federal Emergency Management Agency, and the Seismic Safety Commission to cooperate in developing a plan and materials.
2. By **December 1992**, the agencies who are parties to the Memorandum of Understanding develop a strategic plan regarding what messages and risk communication techniques are appropriate to specific audiences, who will develop materials, and how the audience will be reached.
3. By **December 1993**, the agencies who are parties to the Memorandum of Understanding review existing and draft materials for accuracy and consistency.
4. Annually review the strategic plan and status of the program.

Resources Needed

The resources needed to agree on this process can be absorbed by the cooperating agencies.

Responsible Agencies

Seismic Safety Commission (L. Thomas Tobin, Executive Director)

Office of Emergency Services (Tom Mullins, Public Information Officer)

Office of State Architect (Larry D. Guthrie, Chief, Seismic Program Section)

Division of Mines and Geology (James F. Davis, State Geologist)

Federal Emergency Management Agency, Region IX (Nick Nikas, Disaster Response)

US Geological Survey (name, position)

American Red Cross (Peggy Brutsche, Education Coordinator)

Structural Engineers Association of California

Pacific Bell (Steven Sem, Customer Guide Manager)

Status

Public information programs are already underway.

Initiative 5.3
Identify and Reduce Tsunami Hazards

Tsunami, waves caused by earthquake-induced movements of the ocean floor, can strike development along the California coast with devastating force. Although tsunami can be created by large earthquakes anywhere in the Pacific, the most likely sources that affect California are along the Aleutian trench in Alaska or off South America. In addition, sudden offsets of the sea floor by thrust faults in offshore California can create damaging waves by moving the sea floor or causing submarine landslides. A tsunami caused by the 1964 Alaskan earthquake struck Crescent City killing 11 and causing about $7 million in property damage. Since 1964, extensive development has occurred along the California coast and is continuing.

California is not prepared for the tsunami hazard. In other parts of the world, land use planning, construction techniques, physical barriers, evacuation plans, and warning systems are used to mitigate this hazard. California has not considered this problem or its mitigation policies for nearly two decades. Improved understanding of the seismology of the Pacific Rim, local offshore geology, the movement of waves across the ocean and near shore, and the effect of waves striking a coastline make it easier to understand and plan for California's exposure.

Objective
By **December 1994**, the Seismic Safety Commission and other responsible state and federal agencies shall assess the risk of tsunami to the California coast and propose a hazard reduction program.

Milestones
1. By **July 1993**, the Seismic Safety Commission, with the National Ocean and Atmospheric Administration and the Office of Emergency Services, gather experts in seismology, oceanography, coastal engineering and geology, land use, coastal and emergency planning, and public policy to reevaluate California's tsunami hazard and recommend additional work.
2. By **January 1995**, the Commission and other responsible state and federal agencies publishes a background report and recommends legislation to reduce tsunami hazards.

Resources Needed
State: The Seismic Safety Commission will need 1/2 PY to plan and about $100,000 for invited papers and the meetings.
Federal: Federal agencies including the National Ocean and Atmospheric Administration, U.S Geological Survey and the U.S. Army Corps of Engineers should absorb the cost of participating.

Responsible Agencies
Seismic Safety Commission (Richard McCarthy)
Office of Emergency Services (Ilene Baumgardner, Assistant Director, Plans)
California Coastal Commission (Peter Douglas, Executive Director)
Department of Conservation, Division of Mines and Geology (Michael Richle, Geologist)
National Ocean and Atmospheric Administration (Curt Mason, Physical Oceanographer)
U.S. Army Corps of Engineers (George Domurat, Oceanographer and Mark Verke, Chief, Emergency Management Division, Sacramento District)
Federal Emergency Management Agency, Region IX (Nick Nikas, Disaster Response)
U.S. Geological Survey (D.S. McCulloch, Geologist)
California Department of Boating and Waterways (Reinhart Flick, Oceanographer)

Status
To be started.

References
1. National Oceanic and Atmospheric Administration, *United States Tsunami's, 1690-1988*, Pub. 41-2, 1989
2. U.S. Army Corps of Engineers, Waterway Experiment Technical Report, *Tsunami Predictions for Pacific Coastal Communities*, H-74-3, J.R. Houston and A.W. Garcia, 1974, Type 16 Flood Insurance Study
3. California Coastal Act of 1976, Government Code Section 3000 *et seq.*

Implementing the Program

This is an ambitious program involving agencies from all levels of government and the private sector—businesses, volunteer groups, schools, and individuals—as well. Responsibilities for seismic safety are diverse; no single agency at any government level can carry out the many tasks that must be accomplished to improve California's seismic safety significantly by the year 2000. Only through cooperative, voluntary efforts will many of the initiatives be carried out.

An important part of the implementation strategy for this five-year program, therefore, has been to develop it with the active participation of the agencies and organizations responsible for carrying it out. A second strategic consideration is that the program should continue to push for spending on reducing hazards, while also urging programs that agencies can undertake without having to find large sums of money. This will help make hazard reduction efforts easier, more attractive, and compatible with other programs.

Financing Seismic Safety

Funding is a critical factor for all state seismic safety programs. It will take years, and billions of dollars, to strengthen bridges and buildings; it will take commitment and dedication from elected officials, legislators, and executives to make the necessary decisions. But spurring this work is the absolute certainty that California will have more damaging earthquakes; if immediate action is not taken, these earthquakes will result in significant loss of life and injury, and will disrupt the fabric of our society. State agencies must find the money to complete this work quickly and efficiently, and must maintain a commitment to seismic safety, if California's future, and its government, are to be kept viable.

Many of the actions advocated in this program are not costly and yet they still pay large dividends in earthquake safety and structural performance. "Doing it right the first time" is the fundamental point behind many of the initiatives. Demanding well done facility designs using appropriate standards, insisting on thorough peer review, assuring that construction practices adhere to the designs and seismic considerations, and requiring proper maintenance cost little extra—but the results pay off in less damages and injuries.

This program also advocates adopting a balanced approach to managing risk as a strategy to maximize seismic performance while controlling costs. Reasonable levels of safety can be achieved by developing and using risk-based standards in conjunction with emergency response and recovery activities to manage risk, at less cost than through hazard mitigation alone. Not every building needs to meet the same standard, and not all risks need be addressed by a construction project. The Commission's proposed *Policy on Acceptable Levels of Earthquake Risk in State Buildings* suggests that concepts of hazard reduction and risk management are interrelated: building performance can be improved through reasonable retrofit projects, performance standards can be based on the building's use, and management techniques can be adopted to reduce the injury and disruption while speeding recovery from the unpreventable damage. This policy is being reviewed by the Legislature and the Administration.

Money spent on earthquake hazard reduction also can pay dividends before earthquakes strike. For example, if we design our emergency management systems to successfully respond to an earthquake, they certainly will be able to respond to all other disasters, whether natural or manmade. And retrofitted buildings will last longer and perform better before the earthquake as well as reducing recovery problems afterward. Estimates have been made of the cost to retrofit existing buildings, establish adequate emergency response capability, and conduct the studies and public

information programs needed to support these activities. These costs, summarized in Table IV, are rough estimates with a huge variation and would be encountered over a period of decades. By comparison, a major earthquake in a metropolitan area will take just a minute or two to cause nearly $100 billion in physical losses, and much more in secondary losses. Losses from the Loma Prieta earthquake are estimated at about $10 billion as shown in Table II. Because this was a "rural earthquake" of moderate magnitude, losses many times greater are expected from earthquakes of similar or greater magnitude in more urbanized areas.

Table IV—Cost of Seismic Safety Initiatives

Initiative		Program Costs[1] (5 Years) in Millions	Public Capital Outlay[2] (30 Years) in Billions	Private Capital Outlay[3] (30 Years) in Billions
1.1	Retrofit Standards	$3		
1.2	Hospitals			9–15
1.3	Older Schools	3–5	2–5	
1.5	State-Owned Buildings		1–2	
1.6	Essential Services Buildings		1–2	
1.8	Home Improvements			2–3
1.9	Mobilehomes			1–2
1.12	Federal Dams Study	0.24		
1.16	Highways		1–1.5	
1.17	Oil Platforms	0.1		
2.1	New Standards	2.5		
2.2	Hazard Maps	12.5		
2.3	Design Policy	0.1		
2.5	Professional Education	0.05		
3.1	Emergency Communication	4.16	.014	
3.2	Emergency Management	3.0		
3.8	Hazardous Materials	0.25		
4.1	Recovery Guidance	0.4		
4.3	Economic Impacts	0.25		
5.1	Research Planning	0.15		
5.3	Tsunami Hazards	0.3		
TOTAL		$30–32 million	$8–15.5 billion	$12–20 billion

[1]Estimated expense to enhance state studies, planning, research, public information, and training for five years

[2]Estimated public sector (state and local government) capital outlay, excluding hospitals and EOCs.

[3]Estimated private sector capital outlay, excluding costs to retrofit potentially hazardous commercial, industrial, or multi-family buildings and facilities constructed of unreinforced masonry or nonductile concrete and those with inadequate wall-to-roof-and-floor connections.

Seismic safety may appear expensive, but the cost is unavoidable in California. The choice is between investing in less expensive mitigation or paying more later in recovery. Even though the cost of recovery is far more than the cost of mitigation, it is never possible to restore society to what it was or to compensate for the human losses. Hazard mitigation and emergency preparations will cost a large amount for a major earthquake, but it will cost an even greater amount for disaster relief and recovery if we don't adequately prepare.

Financing hazard reduction and emergency planning programs has been left largely to local governments and the private sector. About half the burden of disaster aid and recovery costs fall on the state and federal governments; the balance is absorbed by the losses of individuals, families, and businesses. While the government is investing in local programs, cities, schools, hospitals, etc., it is evident that the private sector—businesses and individuals—should be investing far larger amounts in hazard mitigation and risk management.

Financial concerns dominate seismic safety programs and their implementation. By California's constitution, programs required of local government by the state must be funded by the state unless there is an alternate source of funding. Funding for hazard mitigation programs and incentives takes money away from other government-funded programs. Although finding sources of funds remains a paramount concern, the strategy of this five-year program also includes pointing out problems, identifying those responsible, and convincing them that solving the problem with their own money is a higher priority than other financial demands.

Action Plans

Implementing each of the 42 initiatives requires actions by a number of organizations toward more than 150 milestones. The action plans, tables V through IX, describe the activities for each calendar year of the program and identify the responsible organizations and the milestones for each year. It is ambitious to schedule activities two or three years in the future, especially when they depend on a number of discretionary, hard-to-deliver, and often costly predecessors. Nevertheless, the action plans for the second and succeeding years can serve as a planning guides as well as measuring devices.

Key to Action Plan Tables:

BCDC—Bay Conservation and Development Commission
HCD—Dept. of Housing & Community Development
BSC—Building Safety Commission
ICBO—International Conf. of Building Officials
CALBO—California Building Officials
OES—Office of Emergency Services
CalOSHA—California Occupational Safety and Health Administration
OSA—Office of State Architect
Caltrans—Department of Transportation
OSHPD—Office of Statewide Health Planning and Development
CDI—California Department of Insurance
CESA—California Emergency Services Association
PUC—Public Utilities Commission
CTC—California Transportation Commission
SSC—Seismic Safety Commission
DGS/OLA—Department of General Services, Office of Local Assistance
SSCCC—Seismic Safety Construction Coordinating Council
SEAOC—Structural Engineers Assoc. of Calif.
DHS—Department of Health Services
SHBSB—State Historic Building Safety Board
DMG—Division of Mines and Geology
SMGB—State Mining and Geology Board
DSS—Department of Social Services
SWRCB—State Water Resources Control Board
DWR—Department of Water Resources
TCLEE—Amer. Society of Civil Engineers, Technical Committee on Lifeline Earthquake Engineering
EMSA—Emergency Medical Services Authority

Table V—1992 Action Plan

Initiative No.	Initiative Title	Milestone No.	Milestone Description	Lead Agency
1.1	Establish Seismic Retrofit Standards	1	Implement Prop. 122 Research Prog.	SSC
		2	Develop/adopt state building retrofit guidelines	OSA, BSC
1.2	Improve Safety of Older Hospital Buildings	1	Request hospital URM information	SSC
		2	Propose legislation for evaluation of pre-Act hospitals	SSC
1.3	Improve Safety of Older Public School Buildings	1	Review inventory and identify buildings needing further evaluation	OSA
		2	Sponsor legislation to retrofit early-Act schools	SSC
1.4	Develop Falling Hazards Guidelines for State Bldgs	1	Draft guidelines for nonstructural building elements	BSC, OSA
1.6	Improve Essential Services Buildings	1	Make recommendations on acceptable levels of risk	OSA
		2	Propose legislation to retrofit old bldgs	SSC
1.7	Improve High-Occupancy Buildings' Safety	1	Propose disclosure legislation	SSC
1.8	Improve Safety of Homes	1	Initiate program to identify vulnerability of homes	SSC
		2	Develop household EQ booklet	SSC
1.10	Conserve Historical Buildings	1	Prepare post-earthquake guidelines	HBSB
1.11	Reduce Workplace Hazards	1	Petition CalOSHA to adopt consistent regulations	SSC
1.12	Review Safety of Federal Dams	1	Complete joint review agreement	DWR
1.13	Improve Performance of Power & Gas Utilities	1	Establish seismic safety criteria	Utilities
1.14	Improve Performance of Water Systems	1	Establish criteria and procedures	DWR
1.15	Improve Performance of Sanitation Systems	1	Recommend improvement actions	TCLEE
1.16	Improve Transportation Structures	1	Complete retrofit designs, award contracts	Caltrans
1.17	Improve Performance of Offshore Oil Facilities	1	Conduct meeting to discuss status of API	SLC
		2	Report on API guidelines	SLC
1.19	Clarify Liability Concerns of Seismic Hazard Mitigation	1	Convene workshop on tort liability	SSC
1.20	Develop Suggested Civil Procedures for Seis. Haz. Mitigation	1	Convene workshop to develop guidelines	SSC
2.1	Improve New Buildings' Seismic Standards	1	Recommend zonation code changes	SEAOC
		2	Appoint committee to study soils, rec. code changes	SSC
		3	Develop code change proposal on performance	ICBO
2.2	Map Geologic Hazards	1	Adopt regul. to be employed by DMS	SMGB
2.3	Establish Independent Seismic Design Review Policies	1	Create an independent Seismic Safety Review Policy Committee	SSC
2.4	Improve State Seismic Design & Construction	1	Submit recommendations from Task Force to the Legislature	BSC
2.5	Improve Seismic Safety Training of Professionals	1	Propose legislation for continuing education and certification	CALBO
3.1	Improve Emergency Communications System	1	Determine improvements needed to communicate & meet medical rqmts	OES

3.2	Improve Emergency Management System	1	Standardize emergency management system process	OES
3.3	Improve Mutual Aid	1	Improve mutual aid system to augment all functions	OES
3.4	Improve Medical Mutual Aid	1	Estimate improvements needed	EMSA
		2	Incorporate protocols into State Emergency Plan	OES
3.6	Improve Shelter Planning	1	Develop policies for shelters	DSS
3.8	Reduce the Risk of Haz Materials Release	1	Recommend to CEPRC actions to improve seismic safety	SSC
		2	Adopt standards for haz. mat. storage	OSFM
3.9	Improve Performance of Telephone Systems	1	Adopt regulations for telephone service	BSC
4.4	Develop Rubble Disposal Strategy	1	Develop a multiagency study plan.	SFC&DC
		2	Present results and recommend. to SSC	SFC&DC
4.5	Provide Post-Earthquake Housing	1	Assess issues and identify responsible agencies	HCD
5.1	Establish Research Plan	1	Review draft plan	SSC
		2	Hold Earthquake Research Evaluation Conference	SSC
		3	Adopt final plan	SSC
5.2	Establish Earthquake Information Strategy	1	Prepare MOU to cooperate in developing plan	SSC
		2	Develop strategic plan	Various

Table VI—1993 Action Plan

Initiative No.	Initiative Title	Milestone No.	Milestone Description	Lead Agency
1.1	Establish Seismic Retrofit Standards	3	Develop code change proposal for nonductile concrete etc.	SEAOC
1.2	Improve Safety of Hospital Bldgs	3	Produce nonstructural hazard reduction guidelines	OSHPD
1.3	Improve Safety of Older Public School Bldgs	3	Propose legislation requiring portables to be anchored	SSC
		4	Identify funding sources	OSA
1.5	Improve Safety of State-Owned Bldgs	3	Propose legislation to provide bonding authority	SSC
1.8	Improve Safety of Homes	3	Review effectiveness of legislation and booklet	SSC
1.9	Improve Safety of Mobile Homes	3	Propose legislation to ensure building standards of mobile homes	HCS
1.10	Conserve Historical Buildings	2	Develop process to identify buildings and proposal for financial incentives	OHP
1.11	Reduce Workplace Hazards	2	Propose legislation, if needed, to amend Titles	SSC
1.12	Review Safety of Federal Dams	2	Complete joint review of federal dams	DWR
1.13	Improve Performance of Power & Gas Utilities	2	Estab. uniform seismic safety criteria	Utilities
		3	Adopt policy on accept. levels of risk	Utilities
		4	Determine if authority is adequate	PUC
1.14	Improve Performance of Sanitation Systems	2	Report on seismic safety standards and procedures	Utilities
1.15	Improve Performance of Sanitation Systems	2	Report to State Water Resources Control Board	Various
1.16	Improve Transportation Structures	2	Complete seismic retrofit and award contracts	Caltrans
		3	Propose legislation to establish funding sources	Caltrans
1.17	Improve Performance of Offshore Oil Facilities	3	Adopt guidelines for offshore facilities	SLC
1.19	Clarify Liability Concerns of Seismic Hazard Mitigation	2	Produce report on tort liability	SSC
		3	Propose legislation to clarify tort liability concerns	SSC
1.20	Develop Suggested Civil Procedures for Seismic Haz Mitigation	2	Submit report to legislature with recommendations	SSC
		3	Provide guidelines to clarify issue and propose legislation if needed	SSC
2.1	Improve Seismic Standards for New Construction	4	Develop code change proposal for consistent seismic design rqmts	SEAOC
2.3	Establish Independent Seismic Design Review	2	Complete draft policy on independent seismic design review	SSC
		3	Adopt schedule for policy implemen.	SSC
2.5	Improve Design & Construction Training	2	Study building departments' qualification and educational needs	CALBO
		3	Evaluate professionals' knowledge of seismic safety	Various
3.1	Improve Emergency Communications	2	Update state phone plan to include satellite communication system	OES
3.2	Improve Emergency Mgmt System	2	Evaluate training, establish guidelines	OES
3.3	Improve Mutual Aid	2	Provide training for local jurisdictions	OES
3.4	Improve Medical Mutual Aid	3	Incorp. changes in State Health Plan	OSHPD
3.5	Determine Emergency Medical Care Needs	1	Complete study of health care services needed	EMSA

3.6	Improve Shelter Planning	2	Incorporate guidance of Milestone 1 into state emergency plan	OES
3.7	Prof. Qualifications of Emergency Managers	1	Convene conference for certification program	OES
		2	Provide certification for emergency managers	CESA
3.8	Reduce the Risk of Haz Mat Release in Earthquake	3	Provide guidance to emergency mgrs	OES
		4	Submit code change proposal re: hazardous materials to ICBO	BSC
3.9	Improve Performance of Telephone Systems	2	Propose Legislation implementing emergency procedures	SSC
4.2	Initiate a State Recovery Plan	1	Develop briefing for affected agencies	SSC
4.3	Estimate Econ. & Gov't Impacts	1	Establish Advisory Committee	SSC
4.4	Develop Rubble Disposal Strategy	3	Incorporate recommendations into CA EQ Hazard Reduction Program	SSC
4.5	Provide Post-Earthquake Housing	2	Determine options for retrofit	HCS
5.2	Establish Earthquake Info. Strategy	3	Review existing and draft materials	Unknown
5.3	Identify and Reduce Tsunami Hazards	1	Conduct meeting to evaluate California's tsunami hazard	SSC

Table VII—1994 Action Plan

Initiative No.	Initiative Title	Milestone No.	Milestone Description	Lead Agency
1.5	Improve Safety of State-Owned Buildings	4	Complete evaluation and posting of placards on haz. bldgs.	Agencies
1.6	Improve Essential Services Buildings	3	Recommend changes to state regulations, model codes, standards	BSC, CALBO
1.9	Improve Safety of Mobile Homes	2	Propose legislation for retrofit of mobile home foundations	HCD
1.10	Conserve Historical Buildings	3	Propose legislation for coord. policy	SHBSB
1.11	Reduce Workplace Hazards	3	Develop and adopt seismic safety regs.	CalOSHA
1.12	Review Safety of Federal Dams	3	Report to Governor & Legislature	DWR
1.13	Improve Performance of Power & Gas Utilities	5	Review and monitor utilities' seismic risk policies	PUC
		6	Establish performance standards	PUC
1.14	Improve Performance of Water Systems	3	Establish seismic safety criteria	Various
		4	Complete earthquake risk analysis	DWR
1.15	Improve Performance of Sanitation Systems	3	Report on emergency response plans	Utilities
1.16	Improve Transportation Structure	4	Complete retrofit designs, award contracts (toll bri)	Caltrans
2.3	Establish Independent Seismic Design Review	4	Consider adopting policy for independent review	CALBO, BSC
2.4	Improve State Agencies Seismic Design and Construction Practices	2	Propose legislation adopting program-based budgeting	SSC
2.5	Improve Seismic Safety Training of Professionals	4	Recommend changes to their continu. education policies and programs	Various
3.2	Improve Emergency Management System	3	Offer local training to implement new guidelines	OES
3.5	Determine Emergency Medical Care Needs	2	Incorporate results of study into State Health Plan	OSHPD
		3	Incorporate results of study into State's emergency plan. guidance	OES
3.7	Improve Professional Qualifications of Emergency Managers	3	Determine incentives to encourage certification	OES
3.8	Reduce the Risk of Haz Mat Release in Earthquake	5	Improve hazardous material storage systems	Owners
3.9	Improve Performance of Telephone Systems	3	Propose legislation ensuring post-EQ function of communication systems	SSC
4.1	Implement Recovery Guidelines	1	Develop recovery/reconstruction module to be used in training	OES
4.2	Initiate a State Recovery Plan	2	Present briefing to Administration	SSC
4.3	Estimate Economic, Governmental Impacts	2	Submit study to Governor & Legislature	SSC
		3	Sponsor legislation for study recom.	SSC
4.4	Develop Rubble Disposal Strategy	4	Distribute the model plan to local governments	SSC
5.3	Identify and Reduce Tsunami Hazards	2	Publish a report and recommend legislation needed	SSC

Table VIII—1995 Action Plan

Initiative No.	Initiative Title	Milestone No.	Milestone Description	Lead Agency
1.1	Establish Seismic Evaluation and Retrofit Building Standards	4	Adopt code change proposals	ICBO
		5	Develop and adopt retrofit standards	OSA, BSC
1.2	Improve Safety of Hospital Buildings	4	Establish standards for acceptable hospital building performance	OSHPD
		5	Prop. legislation to establish hospital hazard mitigation program	SSC, OSHPD
1.3	Improve Safety of Older Public Schools	5	Develop and adopt seismic retrofit standards for schools	OSA
1.4	Develop Falling Hazard Guidelines for State Bldgs	2	Approve guidelines as standards	BSC
1.5	Improve Safety of State-Owned Buildings	5	Complete bracing of nonstructural elements	Agencies
1.13	Improve Performance of Power & Gas Utilities	7	Issue regulations to enforce seismic safety standards	PUC
1.14	Improve Performance of Water Systems	5	Develop policy on acceptable level of earthquake risk	DWR
1.15	Improve Performance of Sanitation Systems	4	Develop a comprehensive policy on earthquake risk	SWRCB
1.16	Improve Transportation Structures	5	Progress rpt on Exec. Order D-86-90	Caltrans
2.1	Improve Seismic Standards for New Construction	5	Develop code change proposal to address effects of frequent, moderate earthquakes	SEAOC
2.5	Improve Seismic Safety Training of Professionals	5	Establish goals and recommend legislation for professional training	Agencies
4.2	Initiate a State Recovery Plan	3	Assign control agency to oversee agency recovery planning	Admin.
4.3	Estimate Economic, Governmental Impacts	3	Propose legislation to implement recommendations	SSC
4.5	Provide Post-Earthquake Housing	3	Develop procedures for providing housing	HCD, OES

Table IX—1996 Action Plan

Initiative No.	Initiative Title	Milestone No.	Milestone Description	Lead Agency
1.3	Improve Safety of Older Public Schools	6	Start actions to strengthen older school buildings	School districts
1.14	Improve Performance of Water Systems	6	Recommendations for earthquake risk	DWR, DHS
1.15	Improve Performance of Sanitation Systems	5	Recommend legislation to enforce earthquake policy	SWRCB
1.16	Improve Transportation Structures	6	Review adequacy of Caltrans seismic safety programs	CTC, SSC
2.1	Improve Seismic Standards for New Construction	6	Adopt improved codes for new constructions	BSC, ICBO
3.9	Improve Performance of Telephone System	4	Report to PUC on progress of mitigation program	Agencies
4.4	Develop Rubble Disposal Strategy	5	Develop strategy for removal of rubble	Cnty Govt's
4.5	Provide Post-Earthquake Housing	4	Recommend procedures for low-income housing retrofit & financing	HCS

Legislation

Progress on many of initiatives will require action by the Legislature and the Governor to establish policy, assign new responsibilities, grant new authority, and appropriate new funds. Legislative action, summarized in Appendix C, made significant progress possible during the first five-year program, and similar action will be needed during the next five years. Enacting these bills will require a concerted effort by the Administration and Legislature and their staffs, technical experts, and affected organizations.

The Commission will continue to adopt a coordinated legislative package each year based on the priorities in this program and will work with all interested bodies to secure enactment of key bills to support existing programs as well as to start new initiatives. The Commission also will continue to support or oppose legislation sponsored by others when required to assure consistency with a balanced, consistent long-term hazard reduction and risk management program.

Table X summarizes the legislation called for in the initiative milestones according to the year of the legislative session.

Table X—Proposed Legislation

Init. No.	Purpose
1992	
1.1	Continued funding of the Proposition 122 Research Program.
1.5	Funding for the Seismic Retrofit of State and Local Government Buildings.
1.7	Establish building standards for high-occupancy buildings and require hazard disclosure on sale.
1.8	Require the continuing education of real estate appraisers, agents and brokers.
1.12	Introduce a joint legislative resolution to memorialize the President and the Congress to require that federal agencies use state requirements and minimum standards for federal water projects, existing dams, and facilities.
1993	
1.2	Require OSHPD to adopt regulations to evaluate and mitigate pre-Act hospitals.
1.3	Require school districts to evaluate and develop a program for the mitigation or replacement of early "Field Act" schools.
1.6	Require the seismic retrofit of pre-1986 essential services buildings.
1.16	Establish funding sources for the seismic retrofit of local and district bridges.
2.4	Enact the recommendations of Building Standards Commission on design and construction policy.
2.5	Require continuing education and certification of construction inspectors.
5.1	Seek funding for and establish an Earthquake Research Program.
1994	
1.3	Require all portable public-school classrooms to be anchored to approved foundations by the year 2000.
1.9	Require existing mobile homes to be retrofitted as necessary to resist earthquakes.
1.19	Clarify the tort liability concerns of local governments and design professionals.
1.20	Clarify "due process" and "taking" issues for local governments.
2.4	Allow a program-based budget process to increase the flexibility and efficiency of earthquake retrofit projects.
3.9	Authorize communications utilities to implement emergency procedures to mitigate overloads and ensure access for essential communications.
1995	
1.10	Establish a coordinated disaster response policy for historical buildings.
3.9	Reduce hazards to ensure the continuation of post-earthquake function of essential communication systems.
5.3	Enact legislation to reduce tsunami hazards to an acceptable level of risk.
1996	
1.7	Require disclosure of potential seismic hazards upon sale of high-occupancy buildings.
2.5	Enact legislation to improve professional training and qualification requirements of design and construction professionals.
4.3	Implement the recommendations of the economic and governmental impact study.

Administrative Implementation

Many of the proposed initiatives require no additional statutory authority, although new administrative regulations or standards are needed in some cases. Usually, however, budget change proposals for either new or redirected resources will be required, calling for approval through the state budget process. The agencies responsible for the initiative milestones must take the actions to redirect funds, revise program priorities, or seek changes in their budgets.

Earthquake hazard reduction activities carried out by agencies will be more effective, easier to coordinate, and geared to produce accomplishments by target dates if each agency develops its own internal multiyear strategic program. Some agencies already have similar programs, and multiyear capital improvement programs are also common. Agency efforts could be considerably enhanced by adoption of an improved capital outlay process, perhaps similar to the process used for seismic retrofit projects.

Interagency Policy Coordinating Committee

The members of the Interagency Earthquake Policy Coordinating Committee represent the agencies listed in Table XI. These persons assisted in the development of this program by offering suggestions, reviewing draft initiatives, and representing the agencies responsible for the state's earthquake programs. The committee was created in 1986 to serve as a forum for information exchange, coordinate activities of mutual interest, and propose revisions to the *California at Risk* program. It provides important agency contacts who review materials and offer comments.

The committee membership reflects the diverse responsibilities and roles state agencies have in earthquake hazard reduction, emergency response, and disaster recovery. Although there is a common bond in knowing of the inevitability of damaging earthquakes and the importance of their responsibilities before and after an earthquake, the levels of interest and involvement differ greatly. Therefore, to improve implementation of this second five-year program, the Commission will begin hosting small focused meetings on specific issues with selected representatives to supplement meetings of the whole committee.

Table XI—Interagency Earthquake Policy Coordinating Committee

Bay Area Regional Earthquake Preparedness Project
Board of Registration for Geologists
Board of Registration for Professional Engineers and Land Surveyors
Building Standards Commission
California Board of Architectural Examiners
California Coastal Commission
California Council on Science and Technology
California Energy Resources, Conservation and Development
California Environmental Protection Agency
California State Training Institute
California State University
California Transportation Commission
Chemical Emergency Planning and Response Commission
Department of Commerce
Department of Conservation, Division of Mines and Geology
Department of Education
Department of Finance
Department of Fish & Game, Office of Oil Spill Prevention and Response

Department of General Services, Division of Telecommunications
Department of Health Services
Department of Housing and Community Development
Department of Industrial Relations, Occupational Safety and Health Standards
Department of Insurance
Department of Social Services
Department of Transportation
Department of Water Resources
Economic Development Commission
Emergency Medical Services Authority
Office of Attorney General
Office of Competitive Technology
Office of Emergency Services
Office of Historic Preservation
Office of Legislative Analyst
Office of Local Assistance
Office of the State Architect
Office of State Fire Marshal
Office of Statewide Health Planning and Development
Public Utilities Commission
Regional Water Quality Control Boards
San Francisco Bay Conservation and Development Commission
Seismic Safety Commission
Southern California Earthquake Preparedness Project
State Contractors' Licensing Board
State Historical Building Safety Board
State Lands Commission
State Mining and Geology Board
State Water Resources Control Board
University of California

Role of the Federal Government

The federal government is the state's partner in earthquake hazard reduction and recovery, and it has a similar responsibility to assure that its own buildings and operations survive damaging earthquakes. President Bush's Executive Order of January 5, 1990, "Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction," called on federal agencies that build or lease facilities, assist construction through loans, loan guarantees and grants, or regulate structural safety to develop mission-appropriate, cost-effective seismic safety programs. Each agency is to ensure appropriate standards are used. Existing federal facilities were not addressed by the Executive Order and remain an important concern.

The federal government's catastrophic emergency response plan brings together federal resources and makes them available to the affected state in a presidentially declared disaster. After the Loma Prieta earthquake, some federal agencies have been directed to assume more immediate response roles.

The federal government also participates in disaster recovery. The Federal Emergency Management Agency, the Small Business Administration, the Department of Transportation, and others offer assistance to individuals, businesses, and local and state governments to provide temporary support, make repairs, and get back into business.

National Earthquake Hazards Reduction Program

The federal government plays a crucial role in efforts to minimize disaster effects and

speed recovery. In 1977 Congress passed the National Earthquake Hazards Reduction Act, which established the National Earthquake Hazards Reduction Program (NEHRP) and directed the four principal agencies—the Federal Emergency Management Agency (Federal Emergency Management Agency), the United States Geological Survey (USGS), the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST—to establish a comprehensive federal program.

The focus of the federal program is to reduce future loss of life and property from earthquakes and prevent the severe social and economic disruption that a catastrophic earthquake could cause. To implement these objectives, the program funds research to strengthen our basic knowledge of earthquakes and develop earthquake-resistant engineering designs. Through this effort, the federal government also provides such tools as resource documents and manuals to assist state and local governments in their mitigation, emergency planning and response, and disaster recovery programs. The state's play important roles by using this knowledge to reduce earthquake hazards.

The responsibilities of the four NEHRP agencies are:

Federal Emergency Management Agency: Federal Emergency Management Agency is the lead agency for NEHRP and is responsible for coordinating federal management activities for all types of disasters and providing technical and financial assistance to state and local governments in carrying out their own emergency management programs. Federal Emergency Management Agency's responsibilities include:

- As the lead agency for the program, preparing a five-year plan to implement the objectives of the act.
- Providing technical and financial assistance for state and local emergency management programs. Through Federal Emergency Management Agency, the federal government provides financial and technical help to state and local emergency management programs to plan and prepare for disasters, and to respond to disasters when they occur. This assistance may provide local governments with additional incentives to develop their own emergency management programs. For example, the development of local emergency plans for approval by the Governor's Office of Emergency Services is one step in establishing the eligibility of local governments to participate in federal financial assistance programs.
- Coordinating federal resources used in disaster relief and providing financial aid under the provisions of the disaster Assistance Act. If state and local resources prove insufficient to respond to a disaster, a governor may not only declare a state emergency but may also request a Presidential declaration of a major disaster. Only the President can declare a major disaster and initiate full-scale federal support for life safety and humanitarian assistance under the authority of the federal Disaster Relief Act. Federal resources may then be mobilized for disaster aid under Federal Emergency Management Agency's coordination.

U.S. Geological Survey: The USGS program includes earthquake-related studies in seismology, geology, and geophysics as well as research and studies in soils engineering. The USGS earthquake hazards reduction program supports fundamental and applied research in earthquake hazards and prediction. The program fosters hazard reduction by providing information for through land-use planning earthquake-resistant engineering design, and emergency planning. The USGS earthquake programs:

- Monitor and evaluate the earthquake potential of seismic areas of the United States.
- Evaluate earthquake hazards and risk in earthquake-prone regions.
- Conduct research to develop the ability to predict the size, location, and time of damaging earthquakes.
- Provide strong-ground-motion data to the engineering community for design and construction standards and conduct research into the physics of ground motion.

- Provide information on earthquake occurrences and hazards to the public, scientific community, and governmental agencies.

National Science Foundation: The NSF funds research on a variety of topics including fundamental and applied research in:

- Seismic design and engineering, and the modernization of existing facilities.
- Societal response, emergency planning, and hazard awareness.
- Seismology, including the implications of plate tectonics and the earthquake process.

National Institute of Standards and Technology: The NIST earthquake program addresses two problem areas: safe and economical new construction, and assessment and mitigation of existing facilities. It seeks to improve building design and construction practices by conducting fundamental research to predict the performance of buildings during an earthquake; to provide technical support in the development of seismic design and construction standards for federal construction; and to encourage the adoption of improved seismic provisions in state and local building codes. Currently, the major thrusts of the NIST program are to:

- Improve design criteria and standards
- Develop more reliable measures of the effects of natural forces on buildings
- Develop methods to evaluate existing buildings
- Conduct post-disaster investigations

Contributing Agencies: A number of other federal agencies are also actively involved in NEHRP as it relates to their basic missions:

- Agency for International Development Office of US/Foreign Disaster Assistance
- Bureau of Reclamation
- Department of Defense
- Department of Energy
- General Services Administration
- National Aeronautics and Space Administration
- Administration
- Tennessee Valley Authority
- Veterans Administration

Program coordination is provided through a number of committees including:

- Interagency Coordinating Committee
- Policy Coordinating Group
- Interagency Committee on Seismic Safety in Construction
- Subcommittee on Federal Earthquake Response Planning
- Interagency Committee on Dam Safety

Budget Reductions and Earthquake Safety

Passage of the first five years in the earthquake hazards reduction program and commencement of the second five-year program coincides with a time of great financial stress and austerity for state and local governments. Formulating the state's budget for the 1991/92 fiscal years was the greatest fiscal challenge in memory for state decision makers. Reduction from 12 to 18 percent in General Fund supported programs are normal. This places many of the earthquake safety programs that provide information and policy guidance to the public, the Governor and the Legislature at risk because they are funded from the General Fund.

In two cases, reserves are to be transferred in June 1992 from special fund accounts to the General Fund. This reduces the flexibility of these programs to provide the services for which the fees were changed. These transfers are shown in Table XII.

Table XII—Transfer from Special Funds

Special Fund Name	Amount to be Transferred on June 1992
School Building Program Account	$6.9 million
Hospital Building Program Account	1.8 million

Table XIII, General Fund Expenditure for Five Years, portrays funding by source for seismic safety programs for the current year and the past five years. General funds

are particularly important to the leadership and promotional programs carried out by the Office of Emergency Services, Division of Mines and Geology and the Commission. While funding increased from the FY 86/87 level of $7.7 million to $10.2 million in FY 90/91, they have decreased to $10.1 million for the current fiscal year to ensure limited funds are wisely spent.

"Down-sizing" state government affects the momentum of the earthquake hazards reduction program and, in the long term, will increase the cost of state and local government. Reductions from current expenditures raise the near certainty of increased costs in emergency response and public assistance following the next damaging earthquake. Any reduction in earthquake hazards mitigation efforts will increase the cost and time for recovery. To paraphrase an old adage "You can pay me now, or you can pay me much more later" couldn't be more true.

Lack of funds adversely affects the effectiveness and efficiency of these public safety government programs. New cost recovery programs require those we need to influence to pay for materials and services we want them to use. The government work place is less efficient. Hiring freezes, instituted to minimize lay-offs, inhibit agencies' ability to fill certain critical personnel vacancies. Restrictions on appointments require that those being laid off by other agencies must be hired ahead of possibly more qualified individuals from the private sector. Pay reductions, and the possibilities of furloughs decrease the capability of agencies to attract top-flight

Table XIII—General Fund Expenditures for Six Years

(Dollars in thousands, rounded)

Agency	Program	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
SSC	CALEEP	175	0	0	0	0	0
	Mitigation	435	560	727	734	767	530
	CEHRP	162	131	94	95	90	95
	URM	113	130	122	124	98	170
	Total	**885**	**821**	**943**	**953**	**1,095**	**795**
DMG	Information	964	1,092	1,047	1,024	1,094	1,049
	Plan Review	125	129	166	297	314	249
	Identify Hazards	633	1,738	1,535	1,429	1,174	1,154
	Total	**2,722**	**2,959**	**2,748**	**2,750**	**2,582**	**2,452**
OES	EQ Projects	748	952	1,153	1,463	2,556	2,835
	EQ Prediction	75	15	0	0	0	0
	Public Info.	69	72	72	117	118	118
	CEPEC	528	588	57	0	0	57
	Total	**1,420**	**1,627**	**1,282**	**1,580**	**2,674**	**3,010**
BCDC	Review Board	13	14	15	15	17	17
	Total	**13**	**14**	**15**	**15**	**17**	**17**
OSA	Essential Services	95	187	195	200	210	220
	Total	**95**	**187**	**195**	**200**	**210**	**220**
CEC	Plant Review	425	425	425	140	140	140
	Total	**425**	**425**	**425**	**140**	**140**	**140**
Dept. of INS	Zoning & Loss	31	32	35	35	37	40
	Total	**31**	**32**	**35**	**35**	**37**	**40**

PUC	Rail Safety	6	18	21	21	25	25
	Utility Safety	19	19	21	21	22	22
	Total	25	37	42	42	47	47
DWR	Seismic Instr.	731	832	553	565	502	528
	Water Projects	431	448	466	525	543	600
	Dam Safety	357	371	386	405	405	385
	Total	1,516	1,651	1,402	1,495	1,450	1,513
UC Berkeley	Seismic Station	150	157	235	43	429	429
	EERC	369	369	369	1,500	1,500	1,500
	Total	519	526	604	1,543	1,929	1,929
	TOTAL	7,651	8,279	7,683	8,753	10,181	10,123

professionals. Moreover, the uncertainty surrounding continued employment has caused morale to plummet even among the most dedicated. Even though these trends may be short lived, government managers must work to improve the situation and focus efforts on priority activities.

The irony is that this is a time when the government and public are demanding more seismic safety information and assistance. Legislative and media interest in earthquake safety continues to expand. The voters spoke by approving over $1 billion in state and local bonds to strengthen and repair existing structures. Local governments and the private sector, despite similar budget difficulties, forge ahead with earthquake hazard mitigation programs. Each of these efforts looks to state government for information and advice; each is an opportunity to advance seismic hazard mitigation. Spending reductions mean the state may be unable to capitalize on these opportunities.

Budget difficulties must not be allowed to thwart progress. Efforts must be focused specifically on high priority, high return activities when funding is limited. California made substantial progress during the first five years on the least expensive initiatives. During the next five years we must confront the costly capital expenditure problem of structure retrofit while improving the capability to make an adequate emergency response. This challenge to continue the progress of seismic programs must be met. The Commission will place additional emphasis on explaining the need and demonstrating the cost effectiveness of these programs. The issue is too important and the ultimate cost is too great not to do so.

Role of the Seismic Safety Commission

The Commission both participates in and monitors the process of implementation through its meetings, meetings of its committees, and reports of its staff. The Commission uses reports, hearings, and workshops to focus attention on the progress of the initiatives and works as a facilitator to pull the separate parts together, coordinate individual actions, and assist the primary agencies in every possible way. Its staff works with program managers and staff in other state agencies to help clarify and refine the initiatives, and emphasize their significance to policymakers. These sustained efforts are critical, since implementation of the initiatives depends on the recognition and active support of state agency executives and staffs over a period of years.

To accelerate the process of implementation, the Commission staff will continue to:

- Meet with appointed agency secretaries, department directors, and the Governor's Emergency Council to present this five-year program, to illustrate the importance of each of their agencies' activities in reducing earthquake hazards, and to seek management and administrative support for existing and proposed initiatives
- Meet with the Department of Finance, the Legislative Analyst's office, and the Assembly Ways and Means, Senate

Budget and Fiscal Review, and Senate Appropriations Committees to provide information on funding needs to carry out the initiatives, to provide other information requested, and to answer questions. The Commission will also participate in budget hearings as necessary

- Seek ways to foster public-private partnerships to further seismic safety
- Work with other state agencies to provide seismic safety information, and recommend experts from the private sector, university faculties, and federal agencies who can provide specialized information and experience-based advice
- Solicit the participation of the League of California Cities, the County Supervisors' Association of California, California Building Officials, California Emergency Services Association, Structural Engineers Association of California, California Council of the American Institute of Architects, and other professional, trade, and governmental organizations and encourage them to foster seismic safety programs for their memberships
- Provide information on the earthquake hazard reduction program to the press, professional organizations, trade magazines, newsletters, and professional journals
- Work with Congress and federal agencies responsible for earthquake hazard reduction and the National Earthquake Hazard Reduction Program to assure that the federal programs consider California's needs and priorities. Of particular importance is Congressional consideration of a national earthquake insurance program. The Commission will keep the California congressional delegation, congressional committees, and federal agencies apprised of the five-year program
- Work with the Federal Emergency Management Agency to identify how federal assistance can help implement the California Earthquake Hazard Reduction Program, and where federal technical assistance can help California efforts the California Earthquake Hazard Reduction Program, and where federal technical assistance can help California efforts
- Report annually on the progress in implementing the initiatives and propose measures to increase support when necessary

Conclusion

This program represents a practical blueprint for reducing earthquake hazards, improving emergency response capability, and preparing for the inevitable recovery that will be needed. Beginning each of these initiatives will require—state agencies and over 550 local governments to understand the critical role they play, to buck trends to put off today that which can seemingly be done tomorrow, and to respond to the long-range plan in spite of crushing immediate demands.

Impossible? No. It's a challenge for leadership.

Appendix A

State Earthquake Safety Programs

Part 1
Hazard Reduction Responsibilities of State Agencies

This appendix provides an overview of activities that are part of the State of California's earthquake hazards reduction program. The agencies that carry out these activities receive funds from the state or the federal government, sometimes both. The following agencies carry out activities directed specifically toward reduction of earthquake hazards.

Department of Conservation
Office of Emergency Services
Department of General Services
Office of Statewide Health Planning and Development
Department of Housing and Community Development
Department of Insurance
Public Utilities Commission
San Francisco Bay Conservation and Development Commission
Seismic Safety Commission
Department of Transportation
Department of Water Resources
University of California
Energy Resources, Conservation and Development Commission
Department of Education
Department of Commerce

Of particular interest are the following activities, started as a result of initiatives outlined in the first five-year program, California at Risk: Reducing Earthquake Hazards 1987-1992. As part of ongoing programs, they are now listed in this appendix.

Existing Buildings and Facilities
Hazardous Infrastructure
Transport Structures
Unreinforced Masonry Buildings
Hazard Reduction Incentives
Homeowners Guide to Earthquake Safety
Commercial Property Owners Guide
State Retrofit Standards
Rural Hospital Grant Program

Emergency Management
Emergency Operations Centers
Information Management System
Damage Scenarios
Urban Heavy Search and Rescue
Tests and Exercises
Emergency Response Training
Structural Hazards Appraisal
Buildings Manager Training
Public Schools Disaster Plans
State Emergency Response Team
University Evacuation Guidelines
Natural Disaster Volunteer Corps

Future Buildings and Facilities
Local General Plan Review
Subdivision Hazards Review

Recovery
Earthquake Insurance
Mental Health
Damage Assessment Standards
Earthquake Emergency Grant-Loan Program
Disaster Housing Rehabilitation Fund

Education and Public Information
Earthquake Preparedness
Model Curricula
School Preparedness
Regional Projects
Policy on Acceptable Levels of Risk

Research
Earthquake Early Warning
Strong Motion Instrumentation Program

Table A-1—Hazard Reduction Funding

Fiscal Year 1991-92
(Dollars in thousands, rounded)

Department Program	General Funds	Revenue Funds	Federal Funds	Total
Dept. of Conservation/Division of Mines and Geology				**8,616**
Geologic Information*	1,049	0	0	
Environmental Protection/Plan Reviews*	249	0	0	
Hazards Assessment Mapping	1,154	2,397	0	
SMIP	0	3,767	0	
Office of Emergency Services				**4,460**
Earthquake Preparedness Projects	2,835	0	1,450	
Public Information	118	0	0	
CEPEC	57	0	0	
California Energy Commission				**140**
Power Plan Review	140	0	0	
Dept. of General Services/Office of State Architect				**17,000**
Essential Services Buildings	220	0	0	
Schools	0	14,680	0	
Hospitals	0	2,100	0	
Public Utilities Commission				**55**
Rapid Transit Preparedness Plans	25	0	0	
Utilities Preparedness Plans	22	0	0	
San Francisco Bay Conservation and Development Commission				**17**
Engineering Review Board	17	0	0	
Seismic Safety Commission				**1,376**
Seismic Safety Activities	530	0	0	
Earthquake Hazards Reduction Program	95	0	0	
Unreinforced Masonry Building Project	170	0	0	
Prop 122 R & D	0	481	0	
SSAB	0	0	100	
Department of Water Resources				**1,513**
Seismic Instrument Operation	528	0	0	
Water Project Review	600	0	0	
Seismic Safety of Dams	385	0	0	
University of California				**3,434**
Seismographic Station	429	0	0	
Earthquake Engineering Research	1,500	0	1,500	
OSHPD				**16,604**
Plan Review	0	16,554	0	
Safety Board	0	50	0	
Caltrans				**420,250**
Bridge Retrofit**	0	45,933	371,641	
Bridge Research	0	2,651	0	
Response Plan	0	25	0	
Totals	**10,123**	**90,151**	**376,697**	**476,971**

*Programs include a small percent of nonearthquake-related expenditures.
**Research and capital outlay programs

Department of Conservation

Geologic Information and Support

Administered By: Division of Mines and Geology
Statutory Authority: Public Resources Code, Section 672, *et seq.*
Year Enacted: 1975 (amended 1976)

Objectives

To gather, analyze, synthesize, and disseminate basic types of geologic information that is of interest and use to a broad range of users.

Activities

Geologic Information and Publications: Provides editorial, drafting, printing, sales, and information services for all of DMG; generates the monthly magazine California Geology, DMG Notes, displays, and other informational documents.

DMG Library: Meets the technical literature needs of DMG staff, other state agencies, and the public.

Regional Geologic Mapping: Gathers basic geologic information needed by other DMG programs and the public; compiles geologic maps; compiles indexes of available literature on California's geology.

Applied Geophysics: Gathers basic geophysical information needed by other DMG programs and the public.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	964	1,092	1,047	1,024	1,094	1,049
State Funds	964	1,092	1,047	1,024	1,094	1,049
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	964	1,092	1,047	1,024	1,094	1,049
Personnel Years	18	19	13	12	12	12

Department of Conservation

Hazards Assessment

Administered By: Division of Mines and Geology
Statutory Authority: Public Resources Code, Section 672 and 2622
Year Enacted: Sect. 672–1975 (amended 1976) Sect. 2622–1972 (amended 1975)

Objectives

To identify, interpret, and evaluate specific geologic hazards which must be considered for informed land-use decisions.

Activities

Fault Zoning Studies: Monitors and evaluates fault activity, produces special studies zone maps, and develops policy and guidelines to assist local governments in land-use planning.

Seismological Investigations: Conducts studies of earthquake mechanisms; evaluates earthquake prediction; and prepares both predictive and post-event damage and ground response maps.

Fault Mechanism Studies: Conducts interpretive studies of fault zones

NEWT System: The NEWT System is an automated seismic data acquisition and analysis system used to monitor the seismic activity in the Long Valley caldera region, making possible timely advice regarding possible volcanic eruptions in the Mammoth Lakes area. These activities are being discontinued effective July 1, 1989.

Parkfield Prototype Earthquake Prediction System: Development and monitoring of a prototype earthquake prediction system in Parkfield along the San Andreas fault.
Earthquake Scenarios: Scenarios of anticipated effects of large damaging earthquakes along various faults in California. Seismic Hazard Mapping Feasibility Study: Investigates the feasibility of microzonation for major metropolitan areas in California.

Estimated Expenditures for Earthquake Hazards Reduction Activities

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	1,675	1,738	1,535	1,429	1,174	3,551
State Funds	1,633	1,738	1,535	1,429	1,174	3,501
Federal Funds	42	20	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	1,675	1,738	1,535	1,429	1,174	3,551
Personnel Years	16	17	16	16	14	27

Department of Conservation

Environmental Protection

Administered By: Division of Mines and Geology
Statutory Authority: Public Resources Code, Section 672 and 2622
Year Enacted: Sect. 672–1975 (amended 1976)
Sect. 2622–1972 (amended 1975)

Objectives

Provide decision-makers with current, reliable, technical information about natural resources and natural hazards on which to base informed land-use decisions.

Activities

Reviews environmental documents, timber harvest plans, mined-land reclamation plans, hospital and school site reports, and other similar documents, and provides lead agencies (local, state, and federal) with comments.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	125	129	166	297	314	249
State Funds	125	129	166	297	314	249
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	125	129	166	297	314	249
Personnel Years	2	2	3	4	4	3

Department of Conservation

Earthquake Engineering (Strong Motion Instrumentation Program)

Administered By: Division of Mines and Geology
Statutory Authority: Public Resources Code 2700, *et seq.*
Year Enacted: 1971

Objectives

To determine how different types of buildings and soils perform under actual earthquake ground shaking.

Activities

The division installs strong motion seismographs on various representative geologic foundation materials and in structures such as buildings, dams, power plants and transportation/utility systems. About 715 instruments are currently located at more than 515 sites. The division is responsible for the maintenance, service, and updating of these instruments as well as the collection, processing, interpretation, and publication of all information obtained by these instruments.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	2,661	2,013	2,805	3,736	3,858	3,767
State Funds	2,661	2,013	2,805	3,736	3,858	3,767
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	2,661	2,013	2,805	3,736	3,858	3,767
Personnel Years	21	21	25	30	32	36

Office of Emergency Services

Earthquake Preparedness Projects

Administered By: Office of Emergency Services
Statutory Authority: Government Code Section 8895.I
Year Enacted: 1980 (Amended 1984)

Objectives

Promote measures to mitigate earthquake hazards, improve emergency response, and facilitate recovery by working with government, private sector, and volunteer organizations.

Activities

Within OES two projects, the Southern California and Bay Area Regional Earthquake Preparedness Projects (SCEPP and BAREPP), provide technical and planning assistance, sponsor regional planning conferences and workshops, maintain resource centers, provide individuals and organizations with earthquake-related information, and enter into partnerships with governments and organizations to help develop comprehensive earthquake plans. In the southern part of the state the focus was expanded to include San Diego County plus a portion of Imperial County in 1987, and San Luis Obispo, and Ventura and Santa Barbara counties in 1990. In the northern California area the focus was expanded in 1990 to include Monterey and San Benito counties.

Estimated Expenditures for Earthquake Hazards Reduction Activities
(Note: Reporting procedures were changed in 1988-89)

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	2,246	2,744	2,497	2,767	4,006	4,285
State Funds	1,121	1,427	1,657	1,463	2,556	2,835
Federal Funds	1,125	1,317	840	1,304	1,450	1,450
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	2,246	2,744	2,497	2,767	4,006	4,285
Personnel Years	23	20.5	27.3	21.5	35.3	34.6

Office of Emergency Services

Earthquake Prediction Plan

Administered By: Earthquake Program Section
Statutory Authority: Government Code Section 8550 et seq.
Year Enacted: 1970

Objectives

1. To develop a plan that will guide the state in responding to reliable earthquake predictions.
2. To evaluate predictions of earthquakes in California.

Activities

OES is currently working with the US Geological Survey in the Parkfield area of Monterey County in assessing the feasibility of short-term earthquake predictions. OES developed a short-term prediction response plan as a result of the "Parkfield" work. Also, OES has organized the California Earthquake Prediction Evaluation Council which evaluates and validates predictions. Currently the "Parkfield" prediction is the only earthquake prediction that has been validated by the Council.

OES completed a short-term earthquake prediction response plan, which provides specific response sections, state agencies and state jurisdictions with standard and consistent guidance on recommended response actions.

Estimated Expenditures for Earthquake Hazards Reduction Activities
(Note: For 1988-89 there was a change in reporting procedures)

	1986-87	1987-88	1988-89
State Operation	75	15	0
State Funds	75	15	0
Federal Funds	0	0	0
Local Assistance	0	0	0
Capital Outlay	0	0	0
Total Expenditure	75	15	0
Personnel Years	1	0	0

Office of Emergency Services

Public Information on Earthquake Safety

Administered By: Public Information Office
Statutory Authority: Government Code, Section 8550, *et seq.*
Year Enacted: 1970

Objectives

To provide the citizens of California with accurate information on earthquakes, their dangers, and ways to prepare for and respond to earthquake-generated emergencies.

Activities

The Public Information Office, in conjunction with BAREPP and SCEPP, disseminates earthquake safety information to the general public, local governments and other groups through various means. The principal activity related to earthquake information is the month-long Earthquake Preparedness Month held annually in April.

Estimated Expenditures for Earthquake Hazards Reduction Activities
(Note: For 1988-89 there has been a change in reporting procedures)

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	69	72	72	117	118	118
State Funds	69	72	72	117	118	118
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	69	72	72	117	118	118
Personnel Years	1	1	1	1	1	1

Office of Emergency Services

Earthquake Program Development

Administered By: Earthquake Program Section
Statutory Authority: Government Code, Section 8550, *et seq.*
Year Enacted: 1970

Objectives

To save lives and reduce property damage by improving the state's earthquake preparedness and ability to respond to any earthquake which severely impacts a local jurisdiction.

Activities

OES oversees a variety of programs and projects directly related to the development and maintenance of earthquake safety in addition to its management of BAREPP and SCEPP.

1. OES maintains the California Earthquake Prediction Evaluation Council as a ten-member advisory group on earthquake and volcanic predictions and forecasts.
2. OES is responsible for the development and publication of earthquake response plans that address special situations, including the Southern California Earthquake Response Plan, the Bay Area Regional Earthquake Response Plan, the Short-Term Prediction Response Plan and the Parkfield Plan.
3. OES conducts periodic exercises with local governments as well as state and federal agencies to evaluate and refine earthquake response capabilities.

Estimated Expenditures for Earthquake Hazards Reduction Activities
(Note: For 1988-89 there has been a change in reporting procedures)

	1986-87	1987-88	1988-89
State Operation	528	588	56.5
State Funds	858	554	56.5
Federal Funds	0	0	0
Local Assistance	0	0	0
Capital Outlay	0	0	0
Total Expenditure	528	594	56.5
Personnel Years	4	3.7	0

Office of Statewide Health Planning and Development

Hospital Construction Monitoring and Structural and Architectural Review

Administered By: Division of Facilities Development and Financing
Statutory Authority: Health and Safety Code, Section 15000 *et seq.*
(Hospital Seismic Safety Act of 1983)
Title 24, State Building Standards Code
Year Enacted: 1983

Objectives

To ensure that all health facilities licensed under Division 12.5 of the Health and Safety Code, Section 15000, *et seq.*, are constructed in accordance with the plans and specifications approved by the office.

Activities

The Division of Facilities Development and Financing conducts architectural, mechanical, electrical, and structural review of proposed hospital construction to ensure compliance with the provisions of Title 24, State Building Standards Code. (A portion of this is carried out through a contract with the Office of the State Architect. Fire safety reviews are performed under contract by the Office of the State Fire Marshal.) Single story wood and light steel frame nursing and intermediate care facilities are reviewed for seismic safety features as well as for their ability to withstand fire and wind. The division observes construction of hospitals to assure that they are built according to approved plans.

The division also reviews facilities for safety following an earthquake and orders evacuation of facilities and discontinued use of unsafe buildings or structures.

Other activities of the division include 1) issuing building permits 2) technical assistance during facility construction, and 3) issuing stop work orders as necessary.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	14,117	14,871	16,875	16,904	17,066	16,554
State Funds	14,117	14,871	16,875	16,904	17,066	16,554
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	14,117	14,871	16,875	16,904	17,066	16,554*
Personnel Years	108	124.1	149.1	144.9	169.1	171.9

* The FY 91/92 budget authorizes expenditure of $26,479,000, however, the program manager has reduced the anticipated level of spending to $16,554,000.

Office of Statewide Health Planning and Development

Building Safety Board

Administered By: Division of Facilities Development and Financing
Statutory Authority: Health and Safety Code, Section 15000 *et seq.* (Hospital Seismic Safety Act of 1983)
Year Enacted: 1983

Objectives

To advise the Office of Statewide Health Planning and Development (Office) and act as a board of appeals with regard to the seismic safety of hospitals.

Activities

The Building Safety Board advises the Office in such areas as research, adoption of regulations, and construction criteria and hears appeals with regard to seismic structural safety of health facilities.

The Board also maintains constant contact through its committees with professional groups and certain industry organizations. In this manner, the Board maintains an awareness of the state of knowledge of seismic structural theory and application, architectural, mechanical, electrical and fire safety theory and application, and of requirements for the physically handicapped.

The Board consists of 17 members appointed by the director of the Office and six ex-officio members designate by statute.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	10	10	23	35	45	50
State Funds	10	10	23	35	45	50
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	10	10	23	35	45	50
Personnel Years	2	2	2	2	2.5	2.5

Department of General Services

Certification of Seismic Gas Shutoff Valves

Administered By: Office of the State Architect
Statutory Authority: Health and Safety Code Sections 19180–19204
Year Enacted: 1980 and 1986

Objective:

To ensure that seismic gas shutoff valves sold and installed in California provide an expedient and safe gas shutoff in an earthquake. The program is limited to after-meter service connections of individual structures to main gas lines and to the connections of appliances to gas lines.

Activities:

The office reviews tests on seismic gas shutoff valves and certifies that the valve designs meet the operational criteria established by the law and can be safely reset by the consumer or owner.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	No direct expenditures					
State Funds						
Federal Funds						
Local Assistance						
Capital Outlay						
Total Expenditure						
Personnel Years	0.3	0.4	0.5	0.5	0.5	0.5

California Energy Commission

Power Plant Certification, Site Selection Review, and Design and Construction Review

Administered By: Energy Facility Siting and Environmental Protection Division
Statutory Authority: Public Resources Code, Section 25000, *et seq.*
Year Enacted: 1975

Objectives

To certify new thermal electrical power plants of 50 MW and larger in California. The review includes consideration of geologic and seismic hazards related to alternative site selection, and facility design in the certification process.

Activities

The Energy Commission has the authority to certify all thermal electrical generating plants and related facilities larger than 50 MW. Within this certification process, geologic and seismic hazards are addressed at two different stages. The first, is the Notice of Intention to File (NOI) stage. In this stage, geologic and seismic hazards are considered in the site selection process. The second stage is the Application for Certification (AFC) stage. In this stage seismic design criteria and methods of analysis for the proposed facilities are reviewed to ensure adequate design criteria are incorporated in the design to account for seismic hazards.

The Commission also performs design and construction review of certified power plants to assure that plant design, construction, and operation conform with Commission decisions and applicable laws, ordinances, regulations and standards.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	425	425	425	140	140	140
State Funds	425	425	425	140	140	140
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	425	425	425	140	140	140
Personnel Years	5	5	5	2	2	2

Department of General Services

Essential Services Buildings

Administered By: Office of the State Architect, Structural Safety Section
Statutory Authority: Health and Safety Code, Section 16000 *et seq.*
Year Enacted: 1985

Objectives

To ensure that state-owned or -leased essential services buildings are designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity, fire, and winds.

Activities

The Office of the State Architect reviews the designs and inspects the construction of state-owned or -leased essential services buildings (fire stations, police stations, and emergency communication centers). The office also reviews the design and inspects the reconstruction, alteration, or addition to essential services buildings and anchorage of their essential equipment.

The legislation which established this program became law January 1986. Key provisions of this new law took effect July 1, 1986.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	95	187	195	200	210	220
State Funds	95	187	195	200	210	220
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	95	187	195	200	210	220
Personnel Years	1	2	2	2	2	2

Department of General Services

Seismic Structural Safety of Hospitals

Administered By: Office of the State Architect, Structural Safety Section
Statutory Authority: Health and Safety Code, Section 15000 *et seq.*
Year Enacted: 1972

Objectives

To ensure that construction of or additions to hospitals are able to resist, insofar as practical, the forces generated by earthquakes, gravity, and wind.

Activities

The Office of the State Architect reviews and approves structural elements of hospitals' (except one-story wood frame or light-steel skilled nursing homes) design plans and specifications for conformance to regulations and recognized engineering performance standards. The office also observes hospital construction to ensure it conforms to approved plans and specifications.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	3,954	3,506	3,189	2,100	2,000	2,100
State Funds	3,954	3,506	3,189	2,100	2,000	2,100
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	3,954	3,506	3,189	2,100	2,000	2,100
Personnel Years	44	43	40	26	22	22

Department of General Services

Seismic Structural Safety of Schools (Field Act)

Administered By: Office of the State Architect, Structural Safety Section
Statutory Authority: Education Code, Sections 39140-39156 and 81130-81146
Year Enacted: 1933

Objectives

To ensure that public schools and community colleges in California are constructed to resist, insofar as practical, forces generated by earthquakes, gravity, and wind.

Activities

The Office of the State Architect reviews all structural plans and specifications for public K-14 schools and community colleges for conformance to building code regulations and recognized structural safety engineering design practices. The office also oversees the construction of public schools to ensure that standards are met.

The 1933 Field Act does not cover private schools, the State University System, or the University of California.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	3,683	6,050	6,393	9,000	11,290	14,680
State Funds	3,683	6,050	6,393	9,000	11,290	14,680
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	3,683	6,050	6,393	9,000	11,290	14,680
Personnel Years	45	74	79	111	127	147

Department of Housing and Community Development

Certification of Mobilehome Earthquake-Resistant Bracing Systems

Administered By: Division of Codes and Standards
Statutory Authority: Health and Safety Code 18500-18700 (Mobilehome Parks Act), California Code of Regulation, Title 25, Chapter 2
Year Enacted: 1985

Objectives

To ensure that mobilehome or manufactured home earthquake resistant bracing systems sold, for sale, or installation in California, meet State standards.

Activities

The department certifies earthquake resistant bracing systems offered by manufacturers for sale or installation in California. These are devices which brace a mobilehome or manufactured home for the purpose of protecting the occupants and reducing damage in the event of an earthquake. Mobilehome or manufactured home owners are not required to install such systems.

Estimated Expenditures for Earthquake Hazards Reduction Activities

The direct cost to the department, since 1985, has been $40,000 funded from the Mobilehome Parks Revolving Fund.

Department of Insurance

California Earthquake Zoning and Probable Loss Evaluation

Administered By: Property and Casualty Division
Statutory Authority: California Administrative Code, title 10, Section 2307
Year Enacted: 1979

Objectives

To protect policyholders by assuring the solvency of the state's insurance companies in the event of a catastrophic earthquake in California.

Activities

The department requires all property and casualty companies in California to report earthquake insurance they write, and to develop statistics which include classification of building construction, location within earthquake zones as listed on the California Division of Mines and Geology maps, and types of insurance issued. This information is compiled by the department and published annually.

Estimated Expenditures for Earthquake Hazards Reduction Activities *

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	31	32	35	35	37	40
State Funds	31	32	35	35	37	40
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	31	32	35	35	37	40
Personnel Years	1	1	1	1	1	1

* All costs are for personnel; increases reflect pay raises.

Department of Insurance

California Residential Earthquake Recovery Fund

Administered By: Department of Insurance
Statutory Authority: Sections 5000–5032 of the Insurance Code
Year Enacted: 1990

Objectives

This program will provide property owners a limited amount of low cost residential earthquake property damage (insurance) coverage.

Activities

This program will supplement the deductible on homeowner's insurance or earthquake insurance policies. The program will initially fund up to $15,000 (eventually $24,000) for damage repairs to single family residential properties consisting of 1 to 4 living units. The Department of Insurance must:

1. Establish the rates to be charged per residential property,
2. Make adjustments to the maximum amount payable in claims based upon the reserves of the fund,
3. Pay claimants for losses, and
4. Establish a residential retrofit loan program, to mitigate potential seismic hazards, when the fund reaches $1.5 Billion.

In addition the California Residential Earthquake Recovery Fund will contribute approximately $1.5 Million per year to fund the Geological Hazard Mapping Program in accordance with AB 3897 (Brown, W), Chapter 1168, Statutes of 1990.

Estimated Expenditures for Earthquake Hazards Reduction Activities

Currently, the liability of the state is limited to the amount of money in the California Residential Insurance Fund. Claims on the fund are limited to $15,000 per occurrence until the reserves of the fund are increased. When fully funded, the maximum claim on the fund will be $24,000. Until the Department of Insurance sets the rates to be charged to each homeowner the amount collected per year is uncertain. Homeowner's will contribute approximately $300 to $400 million per year. The program will become effective on January 1, 1992.

Public Utilities Commission

Earthquake Preparedness Plans

Administered By: *Safety Division* Railroad Operations and Safety Branch Railroad and Rapid Transit Safety Section
Statutory Authority: Public Utilities Code, Section 29047
Year Enacted: 1957

Objectives

BART—To assure proper earthquake safety procedures are developed and maintained for the San Francisco Bay Area Rapid Transit (BART) District.

SCRTD—To assure proper seismic design and geotechnical investigation of the Southern California California Rapid Transit District (SCRTD); to promote comprehensive monitoring of seismic activity throughout the right-of-way of the system; and to encourage development of detailed safety procedures.

Activities

BART—As part of the oversight of the safety appliances and procedures of BART, the PUC has required the BART District to prepare an earthquake preparedness plan. At the request of the PUC, the BART District has also installed eight motion-sensing devices on various BART lines that would signal the central control office in Oakland in the event of an earthquake.

SCRTD—As part of oversight of safety appliances and procedures, Commission staff reviews design and specification drawings and safety procedures, monitors seismic sensing devices, and participates in design review sessions.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	6	18	21	21	25	25
State Funds	6	18	21	21	25	25
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	6	18	21	21	25	25
Personnel Years	0	0	0	0.5	0.5	2.5

Public Utilities Commission

Electrical and Gas Utilities Earthquake Preparedness Plan

Administered By: Safety Division Service and Safety Branch
Statutory Authority: Public Utilities Code, Sections 216 and 315 General Order 95, 112, 128
Year Enacted: 1948, 1960

Objectives

1. To assure that safety procedures are developed, maintained, and exercised.
2. To promote additional communication capabilities with possible redundant systems or circuits by utilities to anticipate system interruptions due to earthquake disturbance.
3. To promote and encourage replacement of old cast iron gas pipelines with new steel and plastic pipelines that will be more durable under earthquake conditions.
4. To assure proper earthquake safety features are included in utility design, construction, and operations.
5. To encourage the conversion of overhead electrical distribution systems to underground installations.

Activities

The commission staff discusses and reviews procedures with the utility companies in the State of California, particularly their safety-related emergency plans for damage control due to earthquakes, emphasizing the need for drills and exercises to keep the utilities' employees constantly alert. Likewise, the staff encourages the utility companies to improve their coordinating and handling of earthquake-caused hazards by improved design, construction, and operation.

Estimated Expenditures for Earthquake Hazards Reduction Activities *

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	25	25	28	28	30	30
State Funds	19	19	21	21	22	22
Federal Funds	6	6	7	7	8	8
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	25	25	25	25	30	30
Personnel Years	0.5	0.5	0.5	0.5	0.5	0.5

*Funds are not identified separately in the budget.

San Francisco Bay Conservation and Development Commission

Engineering Criteria Review Board

Administered By: San Francisco Bay Conservation and Development Commission
Statutory Authority: Government Code, Section 66600 *et seq.*
Year Enacted: 1969

Objectives

To assure new bay front construction within the commission's jurisdiction is designed and constructed in consideration of the unique characteristics of the bay soils and the seismic exposure.

Activities

Applications for new bay fill (including structures on earth fills, floating on the water, and on piles) are reviewed by the commission's eleven-member, volunteer Engineering Criteria Review Board to assure the level of risk is appropriate to the nature of the proposed development.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	13	14	15	15	17	17
State Funds	13	14	15	15	17	17
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	13	14	15	15	17	17
Personnel Years	0	0	0	0	0	0

Seismic Safety Commission

Seismic Safety Activities

Administered By: Seismic Safety Commission
Statutory Authority: Government Code Section 8890, *et seq.*
Year Enacted: 1975

Objectives
Improve earthquake safety in California relating to earthquake hazard reduction.

Activities
The Commission is an independent body that carries out a variety of earthquake safety efforts. The Commission:

- sets goals and priorities;
- requests State agencies to devise criteria to promote seismic safety;
- recommends program changes to state and local agencies and the private sector;
- reviews reconstruction efforts after damaging earthquakes;
- gathers, analyzes, and disseminates information on earthquake hazards, mitigation measures, emergency response, and recovery;
- encourages research;
- sponsors training;
- helps coordinate earthquake safety activities at all levels of government;
- comments on state agency budgets for seismic safety activities;
- reviews and sponsors legislation related to earthquake safety;
- recommends addition, deletion, or changing of state agency earthquake standards;
- conducts public hearings;
- recommends policy and program changes to the Governor and Legislature, public agencies, and the private sector

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	435	584	728	734	767	604
State Funds	435	560	727	734	767	604
Federal Funds	0	24	1	0		
Local Assistance	0	0	0	0		
Capital Outlay	0	0	0	0		
Total Expenditure	435	584	728	734	767	604
Personnel Years	7.7	7.7	10	10	10	9

Seismic Safety Commission

California Earthquake Hazards Reduction Program

Administered By: Seismic Safety Commission
Statutory Authority: Government Code Section 8870
Year Enacted: 1985

Objectives

Significantly reduce earthquake hazards in California by the year 2000 through implementation of initiatives at the local, state and federal government levels, and in the private sector.

Activities

In FY 1985-86, the Commission prepared a five-year program with the assistance of numerous state agencies, professional organizations, and other individuals with expertise in earthquake safety. This program was published in a report entitled *California at Risk: Reducing Earthquake Hazards 1986-1992* outlining six areas where actions were needed: (1) Existing Development, (2) Emergency Planning and Response, (3) Future Development, (4) Recovery, (5) Education and Public Information, and (6) Research. The Commission annually prepares a revision of the five-year program to describe progress made in implementing the program. In October 1991 the Commission adopted the second five-year program, *California at Risk: Reducing Earthquake Hazards 1992-1996*.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	162	131	94	95	90	95
State Funds	162	131	94	95	90	95
Federal Funds	0	0	0	0	0	0
					0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	162	131	94	95	90	95
Personnel Years	1	1	1	1	1	1

Seismic Safety Commission

Unreinforced Masonry Building Program

Administered By: Seismic Safety Commission
Statutory Authority: Government Code Section 8875
Year Enacted: 1985

Objectives

Building departments of cities and counties identify potentially hazardous unreinforced masonry buildings and establish programs to mitigate hazardous conditions.

Activities

The Commission is required to monitor local government progress, provide guidance and report annually. It developed a guidebook to help building departments, elected officials, and building owners carry out the Unreinforced Masonry Building Law. A series of workshops for building officials have been held to help facilitate completion of this program. The Commission mails a bulletin to building officials as new information is available. An annual report is given to the Legislature and Governor on June 30 each year. Additional materials for building owners and local officials is being prepared.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	113	130	122	124	98	170
State Funds	113	130	122	124	98	170
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	113	130	122	124	98	170
Personnel Years	0	0	1	1	1	1.7

Seismic Safety Commission

Proposition 122 Earthquake Research and Development Plan

Administered By: Seismic Safety Commission
Statutory Authority: Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990, Government Code 8878.55 (d)
Year Enacted: 1990

Objectives

To research and develop methods, techniques, and technologies for the identification, analysis, and seismic retrofit of existing potentially hazardous buildings and facilities as well as to help develop and prepare buildings standards and administrative regulations relating to the seismic retrofit of buildings.

Activities

The Commission has completed the first phase of this R & D plan by identifying goals and priorities for the plan as described in its report titled *Breaking the Pattern: A Research and Development Plan to Improve Seismic Retrofit Practices for Governmental Buildings.* Four R & D products are envisioned:

- Development of seismic retrofit provisions and commentary.
- Development of improved earthquake risk management tools.
- Directed research to support the development of the above products
- Technology transfer of seismic retrofit issues to users.

Phase II of the plan is currently underway. The Commission will develop specific scopes of work, budgets, timelines and administrative guidelines for the R & D Program.

Phase III, the actual R & D effort, will commence with the award of contracts in late FY 91-92.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1990-91	1991-92
State Operation		
Bond Funds	140	481
State Funds		
Federal Funds		
Local Assistance		
Capital Outlay		
Total Expenditure	140	481
Personnel Years	.25	1.3

Department of Transportation

Bridge Retrofit Program

Administered By: Division of Structures, Office of Structure Design and Office of Structure Construction
Statutory Authority: Government Code, Section 14000, *et seq.*
Year Enacted: 1971

Objectives

To improve the resistance of state highway bridges and overpasses against earthquake-induced collapse.

Activities

The program involves the strengthening or replacement of joints and bearings on the approximately 13,000 bridges of the State Highway System (there are approximately 13,000 city and county bridges that are not affected by this retrofit program). In 1971, the Division of Structures identified about 1300 bridges that required retrofitting to improve their seismic safety. The first phase of the program is now essentially complete. Total capital outlay expenditures to date have been about $55 million, and state operations expenditures for the Phase 1 retrofit program are estimated at $9 million (150 personnel years).

In 1988, Caltrans began Phase 2 of its ongoing retrofit program to strengthen vulnerable bridges in high seismic areas and improve the seismic resistance of substructures, including abutments and columns. This retrofit effort concentrated on structures in areas of high probability of large seismic motions in the next 20 to 50 years. As a result of the Loma Prieta earthquake of October 1989 the retrofit program was expanded to include the retrofit of all state and local bridges.

Senate Bill SBx-36 (Chapter 18x, Statutes of 1989) mandated that Caltrans upgrade all publicly used bridges in the State to resist collapse. Based on the priority list of all state and local bridges Caltrans developed retrofit projects, many of which are in the design stage or under construction. All of the projects will be reviewed by the Structural and Seismic Analysis Unit to determine if some of the structures identified for retrofit can be removed from the retrofit program. This review process is to be completed by the end of June 1992. Completion of the retrofit program is tentatively scheduled to be completed before the Seismic Safety Commission's target date of the year 2000.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	48	46	8,75	925	2,457	41,574
State Funds	5	5	96	102	270	4,573
Federal Funds*	43	41	7,79	823	2,187	37,001
Local Assistance	0	0	0	0	0	0
Capital Outlay	478	60	16,000	16,000	71,000	376,000
State Funds	53	7	1,760	1,760	7,810	41,360
Federal Funds	425	53	14,240	14,240	63,190	334,640
Total	526	106	24,750	15,063	73,457	417,754
Personnel Years	1	1	25	25	63	1,014

*Federal funds are estimated at 89 percent of expenses.

Department of Transportation

Research on Effects of Earthquakes on Transportation System

Administered By: Division of Construction, Office of Transportation Laboratory, Geotechnical Engineering Branch and Engineering Geology Branch
Statutory Authority: Government Code, Section 14000 *et seq.*
Year Enacted: 1971

Objectives
To improve understanding of earthquake effects on the state's bridges and highway system.

Activities
The Geotechnical Engineering and Engineering Geology Branches act as consultants to other Caltrans units involved in the design of new highway projects. Upon request, these units research the seismic safety of new highway projects, including geologic investigations of faults in the vicinity of the projects, and recommend the seismic considerations to be used in the projects' designs.

Research at the University of California at Davis is testing the dynamic behavior of a model mechanically stabilized earth wall system in a small centrifuge that can induce earthquake loads to the model. Observed behavior will be compared to that predicted by theoretical analyses to help determine if these wall systems should be used in high seismic areas.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	120	120	173	0	0	0
State Funds	66	66	91	0	0	0
Federal Funds	54	54	82	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	120	120	173	0	0	0
Personnel Years	2	2	2	0	0	0

Department of Transportation

Research on Structural Behavior of Bridges in Seismic Activity

Administered By: Division of Structures, Office of Structure Design and Office of Structure Construction
Statutory Authority: Government Code, Section 14000 *et seq.* Federal Highway Code, Title 23, Section 307C2
Year Enacted: 1971

Objectives

To improve the seismic performance of bridge components and develop effective and economical retrofitting models for existing bridges.

Activities

University of California, Berkeley—Conduct research retrofit to develop effective earthquake techniques that will ensure the safety of existing bridges.

- Inspect the the Bay Bridge, collect data, and assess its seismic condition.
- Evaluate retrofit techniques for multilevel structures.
- Develop guidelines for nonlinear analysis.
- Evaluate seismic response of deep soil sites in the San Francisco area.
- Evaluate the Dumbarton Bridge response data from the Loma Prieta earthquake.

University of California, Irvine—Determine the failure mode and force deflection characteristics of slender wall-type bridge piers by developing and testing physical and analytical models that determine the effect of changing pier reinforcement. These studies will evaluate the shear strength/rotation of column pin connectors. This project was formerly conducted at University of California, Los Angeles.

University of California, San Diego—Analyze of the performance of the I-605/I-5 interchange bridge damaged in the Whittier Narrows earthquake and prepare recommendations for other seismic bridge retrofit projects with an emphasis on preventing shear failure. Develop and test analytical models to determine strength and deformation capacities of bridge components and develop effective and economical retrofitting measures for bridge columns, footings, bents, etc.

University of California, Davis—Perform experimental measurements of bridge abutment behavior (stiffness, damping and ultimate strength characteries).

University of Nevada, Reno—Conduct a full-scale, medium-level vibration test on the Meloland Road Overcrossing to assess the dynamic stress induced during the 1979 earthquake, and provide an assessment of design procedures for this bridge type.

Gensys—Conduct a seismic evaluation of the San Francisco–Oakland Bay Bridge.

Applied Technology Council—Prepare an evaluation of Caltrans seismic criteria.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	20	40	31	346	2,591	2,651
State Funds	9	18	14	346	2,591	2,651
Federal Funds	11	22	17	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	57	349	529	0	0	0
State Funds	26	157	238	0	0	0
Federal Funds	31	192	560	0	0	0
Total	77	389	560	346	2,591	2,651
Personnel Years	0	1	0	1	5	5

Department of Water Resources

Operation and Maintenance of Seismic Instruments

Administered By: Earthquake Engineering Section
Statutory Authority: Water Code, Section 10004, *et seq.*
Year Enacted: 1959

Objectives

To monitor, collect data, and report to appropriate agencies seismic activity near facilities of the State Water Project.

Activities

The Earthquake Engineering Section monitors the telemetered network that records earthquake activity from seismic signal readings. These readings are telemetered from seismographic stations near State Water Project dams, the University of California, Berkeley, the California Institute of Technology, the University of Nevada, and the US Geological Survey.

When seismic readings have reached a predetermined magnitude, the Earthquake Engineering Section notifies the appropriate state and federal parties. These parties include the Department of Transportation, the Division of Safety of Dams, the Project Operations and Control Center of the State Water Project, the Office of Emergency Services, and the US Bureau of Reclamation.

In performing this service, the Earthquake Engineering Section also provides a historical record of earthquake activity.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	128	133	138	141	126	132
State Funds	128	133	138	141	126	132
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	220	300	0	0	0	0
State Funds	220	300	0	0	0	0
Federal Funds	0	0		0	0	0
			0			
Total Expenditure	348	433	138	141	126	132
Personnel Years	5.0	4.0	4.0	3.8	3.8	4.3

Department of Water Resources

State Water Project Design, Review, and Construction

Administered By: Division of Design and Construction, Division of Operations and Maintenance
Statutory Authority: Water Code, Section 1004, *et seq.*
Year Enacted: 1959

Objectives

To ensure State Water Project facilities can withstand predetermined seismic events.

Activities

The Division of Design and Construction designs and builds state-of-the-art water conveyance systems that can withstand earthquakes of a predetermined magnitude.

The Division of Operations and Maintenance reviews and analyzes existing water project facilities to ensure continued ability to withstand predetermined seismic events and also conducts seismic reviews of project facilities that are licensed by the Federal Energy Commission.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	431	448	466	525	453	600
State Funds	431	448	466	525	543	600
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	431	448	466	525	453	600
Personnel Years	10	4	4	5	4	6

Department of Water Resources

Supervision of Safety of Dams

Administered By: Division of Safety of Dams
Statutory Authority: Water Code, Section 6000, *et seq.*
Year Enacted: 1929

Objectives

To supervise the construction, operation, maintenance, repair, enlargement, alteration, and removal of dams and reservoirs, to ensure the protection of life and property.

Activities

The division supervises all dams and reservoirs except those owned by the federal government and those exempted by reason of nonjurisdictional size, function, or specific structural character.

The division reviews, investigates, and evaluates all applications for new construction pursuant to approval. Current construction activities are subject to frequent field inspections and safety evaluations performed by the division. Finally, the division monitors existing dams by conducting frequent field inspections and safety evaluations. Existing dams in certified status also reevaluated to verify compliance with safety design and performance standards. The application reviews and the reevaluations include developing and applying site specific seismic parameters.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	357	371	386	405	405	385
State Funds	357	371	386	405	405	385
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	357	371	386	405	405	385
Personnel Years	5	4	4	4.2	3.8	3.0

University of California

Seismographic Station

Administered By: University of California, Berkeley
Year Enacted:

Objectives

To discern, monitor, analyze, and document seismicity throughout California and the West Coast, through advanced technological research.

Activities

The Seismographic Station at Berkeley continuously monitors telemetered signals from a network of more than 15 stations located around northern California and western Nevada. Through this network, the Seismographic Station locates and determines magnitudes of both local and distant earthquakes and notifies the appropriate public agencies (e.g.,California Office of Emergency Services, the Federal Disaster Assistance Administration, California Department of Water Resources, and the California Department of Transportation).

The Seismographic Station also routine analyzes earthquakes using microcomputers. Software has been developed for 1) registration of earthquakes, 2) routine and research processing, and 3) retrieval of seismic information. A major program of recording and analysis of strong ground motion is also carried out in California and China. The results of this ongoing earthquake observation and analysis include the production of earthquake catalogs for study by seismologists internationally; a California seismogram data file dating back to 1910.

The Seismographic Station is undergoing major upgrade of its facilities, including modernization of the northern California stations which are gradually being equipped with very-broad-band digital seismometers as well as strong motion instruments. The new instrumentation will be operational at 6 stations by the end of 1991, the goal being 15-20 stations by 1993 recording digitally weak and strong motion from 10Hz to DC with real-time telemetry to the central UC Berkeley site. The computer facilities are also being upgraded to allow more rapid and more sophisticated analysis of earthquake data, with a goal of being able to estimate rapidly not only magnitude but also the seismic moment tensor for all earthquakes in northern California of significant size. The Station is also developing, jointly with USGS/Menlo Park, an on-line database of seismic waveforms for northern California. This database will be available to outside users through standard computer networks.

In addition to analyzing earthquakes, professors and students at the station make special studies of a large number of seismic events and issue research reports under contracts with various federal and state agencies.The station also hosts visiting seismology professors from foreign countries who perform extensive earthquake research, particularly on earthquake ground motions, earth structure, and earthquake prediction. Staff of the Seismographic Station participate in public and professional service activities related to earthquake hazards such as public speeches, publications, special lectures and seminars.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	950	988	1,482	43	429	429
State Funds	150	157	235	43	429	429
Federal Funds	800	831	1,247	5	5	5
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total	950	988	1,482	78	491	491
Personnel Years	18	18	18	18	18	18

University of California

Earthquake Engineering Research Center

Administered By: University of California, Berkeley
Statutory Authority: Established as an organized research unit.
Year Enacted: November 30, 1967

Objectives:

To contribute to the earthquake engineering field through advanced research.

Activities

The activities of the Earthquake Engineering Research Center (EERC) include (1) the National Information Service for Earthquake Engineering, (2) research programs funded, for the most part, by the National Science Foundation, (3) Service-to-Industry Programs, and (4) participation by faculty in public and professional service activities.

The National Information Service for Earthquake Engineering (NISEE)—NISEE is a joint project of the EERC and the Earthquake Engineering Laboratory, California Institute of Technology. NISEE's main objective is to disseminate information on earthquake engineering and allied fields.

Research Programs—Research programs at the EERC involve the cooperative studies of visiting scholars from different countries in seismically active areas of the world and faculty members from several departments of the University of California, Berkeley. Professional staff and research assistants at the EERC also play a vital role in these research programs.

Service-to-Industry Programs—The EERC's Service-to-Industry program is a research and public service program made available through the College of Engineering, Office of Research Services. Faculty expertise and facilities at the EERC's Earthquake Simulator Laboratory are used to conduct specialized applied research projects for business and industry.

Participation By Faculty in Public and Professional Service Activities—Speeches, publications, committee service, advisory and consulting services are just a few examples of the kinds of activities in which EERC faculty participate.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	1,869	1,869	1,869	3,000	3,000	3,000
State Funds	369	369	369	1,500	1,500	1,500
Federal Funds	1,500	1,500	1,500	1,500	1,500	1,500
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	1,869	1,869	1,869	3,000	3,000	3,000
Personnel Years	25	25	25	20	20	20

Part 2
Disaster Support Responsibilities of State Agencies

Nine state agencies are responsible for the functions described in this section. These functions support preparations and responses for any natural or human-caused disaster. During disasters, these agencies provide support for both emergency planning and response activities:

California Conservation Corps
Emergency Medical Services Authority
California Highway Patrol
Military Department
Department of Transportation
Department of Water Resources
California Energy Resources, Conservation and Development Commission
Office of Emergency Services

Local assistance funds are provided by state and federal sources to local jurisdictions for their use in planning, exercises, and response activities. In 1991, legislation directed the Department of General Services to create a Geographic and Land Information System task force that will be included in Part 2 when it becomes implemented.

Table A-2—Disaster Support Funding

Fiscal Year 1991-92
(Dollars in thousands, rounded)

Department Program	General Funds	Revenue Funds	Federal Funds	Total
Caltrans				**74**
Response Plan	49	25	74	
Office of Emergency Services				**186,701**
Disaster Response	85,386	101,315	186,701	
Cal Conservation Corps				**3,850**
Disaster Response	3,850	0	3,850	
EMSA				**6,218**
System Development	5,289	0	5,289	
Response Planning	929	0	929	
CHP				**890**
Emergency Traffic Control	890	0	890	
Military Dept.				**21**
Disaster Response	6	0	6	
Emergency Traffic Control	15	0	15	
DWR				**396**
Response Plan	396	0	396	
CEC				**50**
Contingency Planning	50	0	50	
Total	**96,860**	**101,340**	**198,200**	**198,200**

California Conservation Corps

Disaster Response

Administered By: Planning Branch
Statutory Authority: Public Resources Code, Section 14,000–14,406
Year Enacted: 1976

Objectives

To provide California with a ready, available labor source to perform resource conservation work and disaster response.

Activities

The corps operates from 17 centers around the state and has a labor source of approximately 1800 18-23 year olds. The labor assistance the corps provides during a disaster includes:

- flood control
- fire fighting
- setting up medical hospitals
- stretcher bearing
- food distribution
- crowd control
- search/rescue of lost or injured persons
- disseminating information

The corps' primary function is to work under the direction of other emergency agencies and to provide labor assistance where needed.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation		4,871	4,871	3,979	3,996	3,850
State Funds		4,871	4,871	3,979	3,996	3,850
Federal Funds		0	0	0	0	0
Local Assistance		0	0	0	0	0
Capital Outlay		0	0	0	0	0
Total Expenditure*		4,871	4,871	3,979	3,996	3,850
Personnel Years**		1	1	1	1	1

* Based on estimate that 7 percent of total expenditures are related to disaster response.
**Planning only, does not include dispatch and operation personnel.

Emergency Medical Services Authority

EMS System Development

Administered By: Emergency Medical Services Authority
Statutory Authority: Health and Safety Code, Section 1797, *et seq.*
Year Enacted: 1980

Objectives

To save lives through the development of Emergency Medical Services (EMS) systems throughout the state.

Activities

1. Develop of implementation and planning guidelines, including the disaster response component, for EMS systems.
2. Review and approval of local EMS systems plans.
3. Design and plan the development of an integrated EMS communication system.
4. Evaluate proposals and provide grant funding to EMS agencies for regional disaster medical response plans.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	729	1,075	1,172	805	1,218	1,279
State Funds	496	900	939	516	943	769
Federal Funds	233	175	233	289	275	510
Local Assistance	3,540	3,197	3,840	4,811	3,648	4,010
State Funds	2,429	1,630	2,729	2,834	3,044	3,935
Federal Funds	1,111	1,567	1,111	1,977	604	1,075
Capital Outlay	0	0	0	0	0	0
Total Expenditure	4,269	4,272	5,012	5,616	4,866	5,289
Personnel Years	13	13	13	12.8	21.4	22.7

Emergency Medical Services Authority

Disaster Response Planning

Administered By: Disaster Medical Services Section
Statutory Authority: Health and Safety Code, Section 1797, *et seq.*
Year Enacted: 1980

Objectives

To improve disaster response capabilities of EMS systems throughout the state and coordinate the State's medical response to a catastrophic disaster.

Activities

1. Develop guidelines for intercounty medical mutual aid based on an integrated EMS system response to a disaster.
2. Develop a computer-based system for management of the medical response to a disaster.
3. Monitor and assist the EMS agencies develop and test regional disaster medical response plans.
4. Develop, participate in, and evaluate disaster exercises that provide training and/or test components of the medical response system.
5. Establish plans and operational procedures in conjunction with other state and local agencies and the private sector to be used in response to a disaster.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	384	432	446	484	508	533
State Funds	384	432	446	484	508	533
Federal Funds	0	0	0	0	0	0
Local Assistance	340	420	529	173	880	396
State Funds	40	86	128	22	13	0
Federal Funds	300	334	401	151	267	396
Capital Outlay	0	0	0	0	0	0
Total Expenditure	724	852	975	657	1,388	929
Personnel Years	5	5	5	6	6	6

Emergency Medical Services Authority

Disaster Response

Administered By: Departmentwide
Statutory Authority: Health and Safety Code, Section 1797 *et seq.*
Year Enacted: 1980

Objectives

To coordinate the state's medical response to a catastrophic disaster

Activities

1. Coordinate the activities of the various state agencies and private-sector participants in a medical response to a disaster.
2. Coordinate the procurement of public and private medical resources from unaffected areas of the state.
3. Respond to requests from affected counties for medical personnel, supplies, and equipment.
4. Manage the evacuation of casualties to hospitals in unaffected areas of the state.
5. Manage the casualty tracking system to provide information for the Welfare and Inquiry Element regarding the location of casualties transported outside the county for medical care.

Estimated Expenditures for Earthquake Hazards Reduction Activities *

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	3	3	6	25	11	0
State Funds	0	0	0	0	0	0
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	3	3	6	25	11	0
Personnel Years	0.04	0.04	0.07	0.4	0.13	0

*Direct costs occur in a disaster requiring EMSA response.

Office of Emergency Services

Disaster Response

Administered By: Departmentwide
Statutory Authority: Government Code, Section 8550 *et seq.*, Executive Order D-25-83
Year Enacted: 1970

Objectives

To coordinate emergency activities of state agencies, save lives, and reduce property losses during disasters, and expedite recovery from the effects of disasters.

Activities

During an emergency, OES functions as the Governor's immediate staff to coordinate the state's responsibilities under the Emergency Services Act and applicable federal statutes. OES also acts as the conduit for federal assistance through natural disaster grants and federal agency support.

In the event of a disaster, OES mobilizes the personnel and equipment of federal, state, and local governments and private supplies for fire and rescue efforts. OES provides on-the-scene staffing and equipment in support of local law enforcement, and operates a data communications system for emergency responses.

OES develops and implements emergency plans and provides specialized training courses in emergency management. OES assists local governments develop plans and procedures to minimize the effect of natural or human-caused disasters.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	12,735	19,033	16,508	17,004	27,900	26,412
State Funds	9,101	15,188	11,949	12,674	22,157	21,512
Federal Funds	3,634	3,845	4,559	4,335	5,743	4,902
Local Assistance	55,600	26,267	43,629	127,623	180,634	160,287
State Funds	18,072	2,104	5,616	41,517	84,221	63,874
Federal Funds	37,528	24,163	38,013	86,106	96,413	96,413
Capital Outlay	0	100	94	0	0	0
State Funds	0	100	94	0	0	0
Federal Funds	0	0	0	0	0	0
Total	68,335	45,400	60,231	144,627	208, 534	186,701
Personnel Years	176.7	195.1	223.9	243.5	273.7	278.9

California Highway Patrol

Emergency Traffic Control

Administered By: California Highway Patrol
Statutory Authority: Vehicle Code 2410
Year Enacted: 1959

Objectives

To enhance public safety during disaster situations through effective traffic management and law enforcement services.

Activities

The emergency responsibilities of the CHP include the following:

- Providing emergency traffic regulation and route recovery assistance
- Setting up traffic control points
- Assisting local jurisdictions restore and maintain law and order
- Assisting local jurisdictions carry out evacuations
- Monitoring, reporting, and using radiological information

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	678	705	747	792*	840	890
State Funds	678	705	747	792	840	890
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	678	705	747	792*	840	890
Personnel Years	10	10	0	0	0	0

* Approximately $1,593,000 was received as reimbursement for Loma Prieta earthquake activities.

Military Department

Disaster Response

Administered By: Plans and Operations Directorate
Statutory Authority: Military and Veterans Code, Sections 142, 143, and 146
Year Enacted: 1935

Objectives

To prepare elements of the California National Guard for emergencies and assist the Governor protect the health and welfare of the state's citizens.

Activities

The Military Department developed earthquake disaster plans and procedures for the California National Guard. The Governor is empowered to call upon the Guard for assistance in a disaster. The Guard's support of an earthquake disaster includes:

- maintenance of law and order
- air and surface transportation of authorized personnel, equipment, and supplies
- distribution of food and essential supplies
- medical treatment and evacuation
- search and rescue
- emergency housing

Estimated Expenditures for Earthquake Hazards Reduction Activities *

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	202	72	60	1,400	10	6
State Funds	202	72	60	1,400	10	6
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	202	72	60	1,400	10	6
Personnel Years	2.0	0.5	0.5	45.5	0.5	0.5

* These are actual costs and do not include administrative overhead.

Military Department

Emergency Transportation Coordination

Administered By: Plans and Operations Directorate
Statutory Authority: Administrative Order being developed
Year Enacted: 1986

Objectives
To coordinate transportation operations in the event of an emergency.

Activities
This activity involves multiple agencies of state government. The Military Department is working with other departments responsible for or capable of providing or securing surface transportation (e.g., rail, trucking, busing, and cars), air transportation, and sea transportation to develop an emergency transportation plan. This plan will identify each state agency's responsibility relating to transportation during an emergency. The Military Department's role is to mobilize these agencies during an emergency according to the emergency transportation plan.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	0	15	15	15	15	15
State Funds	0	15	15	15	15	15
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
Total Expenditure	0	15	15	15	15	15
Personnel Years	0	0	0	0	0	0

Department of Transportation

Emergency Response Planning

Administered By: Division of Maintenance
Statutory Authority: Government Code, Section 14000, *et seq.*
Year Enacted: 1971

Objectives

To improve Caltrans' ability to respond to disasters affecting the state highway system and to coordinate this response with the Office of Emergency Services.

Activities

Caltrans Emergency Response Planning Program provides emergency response information to its district offices. In the event of an earthquake, Caltrans headquarters may direct and coordinate response with the Office of Emergency Services.

The Caltrans emergency planning director is located within the Division of Maintenance and is responsible for developing a Caltrans Emergency Plan which provides emergency response information for its district offices. The department participates in emergency response workshops, exercises, and training, often in conjunction with the Office of Emergency Services, federal Department of Transportation, and other agencies.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	36	7	7	5	5	4
State Funds	36	7	7	25	25	25
Federal Funds	0	0	0	25	25	25
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	10	25	20
Total Expenditure	36	7	7	65	81	74
Personnel Years	1	1	1	1	1	1

Department of Water Resources

Emergency Response Planning

Administered By: Division of Operations and Maintenance, Civil Maintenance Branch
Statutory Authority: Water Code, Section 10004, *et.seq.*
Year Enacted: 1957

Objectives

To improve State Water Project disaster response and coordinate this response with concerned water agencies and other organizations.

Activities

The State Water Project Emergency Response Plan provides information to all entities in the Department of Water Resources. The Earthquake Plan establishes procedures for determining the extent of damage to the project, providing emergency supplies of water to affected areas and rehabilitating the water delivery system.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	383	399	415	424	377	396
State Funds	383	399	415	424	377	396
Federal Funds	0	0	0			
Local Assistance	0	0	0			
Capital Outlay	220	300	0			
State Funds	220	300	0			
Federal Funds	0	0	0			
Total Expenditure	603	699	415	424	377	396
Personnel Years	5	4	4			

California Energy Commission

Energy Shortage Contingency Planning

Administered By: Executive Office, Contingency Planning Group
Statutory Authority: Public Resources Code, Section 25216.5, 25700 *et seq.*
Year Enacted: 1975

Objectives

To prepare, test and continually update the California Energy Shortage Contingency Plan and maintain operational readiness to respond to an energy supply shortage or disruption.

Activities

The Energy Commission is required by law to prepare a plan for responding to a shortage of energy, or a clear threat to public health, safety or welfare. Energy shortages can be caused by natural disasters, such as earthquakes, fires, or floods, or by geopolitical events, such as war, terrorism, sabotage, or embargo. The Commission routinely monitors domestic and international events that have the potential to disrupt the energy supply systems.

The Commission also conducts training for state and local officials in energy emergency response and works closely with the Governor's Office of Emergency Services and other agencies in carrying out its contingency planning responsibilities. If an event, such as a major earthquake, causes a sudden loss of supply, the Commission would evaluate its impacts and recommend to the Governor appropriate actions to mitigate a shortage.

Estimated Expenditures for Earthquake Hazards Reduction Activities

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
State Operation	50	50	50	50	50	50
State Funds	50	50	50	50	50	50
Federal Funds	0	0	0	0	0	0
Local Assistance	0	0	0	0	0	0
Capital Outlay	0	0	0	0	0	0
State Funds	0	0	0	0	0	0
Federal Funds	0	0	0	0	0	0
Total Expenditure	50	50	50	50	50	50
Personnel Years	.5	.5	.5	.5	.5	.5

Part 3
Recovery Support Responsibilities

Eight state agencies, four federal agencies and three private organizations that provide recovery assistance are described in this section. These programs provide disaster aid and influence the long-term recovery of damaged communities.

Eighteen months after the Loma Prieta October 1989 earthquake, federal and state agencies have spent and obligated more than $1.5 billion for assistance and recovery programs. The Loma Prieta earthquake caused an estimated $9.8 billion in losses to the public and private sectors. Although a number of expenditures for repairs to major buildings and freeways are not complete, most of the remaining $8 billion loss has been covered by local governments and the private sector.

Table A-3—State Funding for Loma Prieta Recovery

(Dollars in thousands, rounded)

Department Program	State Funds
Board Control	41,500
Dept. of Commerce	7,929
Dept. of Finance	4,179
Dept. of Housing & Community Development	106,800
Dept. of Social Services	21,815
Dept. of Transportation	37,607
Franchise Tax Board	97,000
Office of Emergency Services	86,634
Total	**403,464**

State Programs

The State of California has a variety of disaster relief programs. Eight agencies administer programs.

Each earthquake is unique, and because they cause major problems for the affected communities, some of these assistance programs were enacted as a one-time program. Similar one-time specially conceived programs should be anticipated as part of any future recovery effort. In response to the Loma Prieta earthquake the Legislature increased the sales tax by 1/4 cent for 13 months. This act raised $763.1 million and by April 1991 $362.1 million had been disbursed or obligated.

Board of Control

The Board administers an expedited, no-fault, liability settlement program for victims of the San Francisco-Oakland bay bridge and the I-880 Cypress Street viaduct collapses. It provides specified amounts depending on the degree of injury to victims and their families.

Approximately $41.5 million has been spent or obligated for the Loma Prieta earthquake.

Department of Commerce

The Department of Commerce administers a "bridge" loan program in cooperation with the U.S. Small Business Administration. The California program reduces business interruption while SBA loan applications are processed. It covers economic damage, and provides grant and loan programs for local governments and for small businesses and agriculture enterprises when aid is not available from other sources.

The department also assists small business owners and communities understand and use disaster aid programs and identifies sources of financial help.

Approximately $7.929 million has been spend following the Loma Prieta earthquake.

Department of Finance

The state reimburses counties for decreased property tax revenues resulting from the reduced value of damaged properties.

Approximately $41.5 million was obligated after the Loma Prieta earthquake. Six counties applied for and received $4.179 million.

Department of Housing and Community Development

The Department of Housing and Community Development administers three disaster assistance programs. The California Disaster Assistance Program (CALDAP) is a two-part program that provides low interest (3 percent) loans for housing rehabilitation costs not paid by other sources. The CALDAP-O program provides loans to owners of single family homes, and the CALDAP-R program provides loans to owners of rental property.

The Farm Worker Housing Grant Program-Natural Disaster Component (FWHG-ND) rehabilitates agricultural worker occupied homes or rental units damaged by natural disasters.

The Emergency Shelter Program-Natural Disaster Component (ESP-ND) provides temporary and emergency housing grants for individuals and families.

As of September 1991 the CALDAP program obligated $96.2 million for the Loma Prieta earthquake damage: $52.08 million to owners of homes, $44.11 million to owners of rental properties, and $10,000 for emergency grants.

As of June 30, 1990, the FWHGP-ND program made 3 grants in Monterey and Santa Cruz counties for a total of $1.5 million, and the ESP-ND program disbursed $9.1 million.

Department of Social Services

The Department of Social Services administers the Individual Family Grant Program (IFG) and the Supplemental Assistance Program (SA) . The IFG provides the state's funds to match the 75 percent federal share of this grant program. The SA program may provide up to $10,000 in addition to the IFG grant.

As of April 1991 these programs obligated $21.815 million for Loma Prieta earthquake damage.

Department of Transportation (Caltrans)

Caltrans administers four categories of recovery programs.

1. A research program is developing revised seismic standards for the design and construction of new state highways and bridges and for the retrofit of existing structures. Research is underway on the retrofit of multi-column structures.

2. A state wide retrofit program is underway on publicly owned bridges.

3. Caltrans is responsible for the repair and reconstruction of state owned highway structures and cooperates with the Federal Highway Administration and FEMA to fund the repair of locally owned structures.

4. Caltrans was directed by special legislation to provide emergency transportation support in areas affected by the Loma Prieta earthquake. This support included funds for surface and other transportation alternatives needed to reduce congestion.

Since the Loma Prieta earthquake these programs have been funded for a total of $37.607 million. Research is funded at $5.129 million, construction has disbursed $5.082 million, street and highway repairs and reconstruction have cost $25.396 million., and emergency public ferry and surface transportation services cost $2.0 million.

Franchise Tax Board

The Board administers a program that allows taxpayers affected by a natural disaster to deduct losses from state taxes. The Revenue and Taxation code was amended to allow Loma Prieta earthquake losses to be claimed for five years instead of the normal three years.

This program obligated $97 million after the Loma Prieta earthquake.

Office of Emergency Service

OES administers state programs that match federal federal aid programs. These programs address losses in four categories: 1) Local Government facilities 2) Private nonprofit damage, 3) K-12 school damage, and 4) Repair of state facilities. The federal government generally provides 75 percent of qualifying losses and the state pays 25 percent.

After the Loma Prieta earthquake, approximately $86.634 million in state funds has been obligated. Approximately $55.991 million is obligated for local government, $9.059 for private non profits, $3.589 million for K-12 schools, and $17.995 for state facilities repairs.

Federal Programs

Four federal agencies administer 11 different categories of disaster assistance. The United States Congress appropriated $2.85 billion for disaster assistance for both the Loma Prieta earthquake and Hurricane Hugo. As of April 1991, federal assistance for the earthquake programs totaled $1.2 billion.

U.S. Department of Education

The Department of Education administers a program to pay to restore public school instructional facilities to pre disaster conditions.

Approximately $10.2 million was disbursed after the Loma Prieta earthquake.

Federal Emergency Management Agency

FEMA administers six categories of assistance. Four programs are for individuals: 1) The Individual and Family Grant (IFG) program, 2) The Temporary Housing Assistance (THA) program, 3) The Individual Emergency Grant program, and 4) The waiver of waiting period for unemployment benefits program. The IFG program provides grants of up to $10,400 to individuals and families for repairs, replacement of possessions, and other needs. The Temporary Housing Assistance program provides renters and homeowners with grants for up to 18 months of emergency housing or up to $5000 for repairs made to make damaged structures safe for habitation.

As of April 1991 FEMA had obligated a total of $69.7 million for individual assistance programs. The IFG program disbursed approximately $36.3 million and the THA disbursed $29.9 million after the Loma Prieta earthquake. Individual Emergency Grants disbursed $300 thousand. The program to waive the waiting period for unemployment benefits provided $3.2 million.

FEMA also administers two Public Assistance programs. FEMA provides disaster assistance to local governments and certain nonprofit organizations for the cost of debris removal, protective services, repair of local roads and bridges, water control facilities, public utilities, and building repairs.

Approximately $146 million was disbursed to state and local governments, and $58.8 to nonprofit entities.

Federal Highway Administration

The Federal Highway Administration funds research on and repairs to federally eligible highways and bridges. These facilities include the interstate highway system and major highways.

Although final damage estimates are not available because engineering analyses, design and construction will take several years, FHA disbursed $52.3 million for research and $288.9 million for repairs after the Loma Prieta earthquake.

Small Business Administration

The SBA administers two categories of disaster assistance: 1) disaster loans to homeowners for uninsured losses up to $100,000 for private residences and up to $20,000 in personal property, 2) disaster loans to small businesses that cover economic injury and property loss or damage up to $500,000.

This program spent approximately $264.2 million for business disaster relief and $306.5 million for individual disaster relief following the Loma Prieta earthquake.

Private Programs

Private organizations and volunteers provide a significant disaster aid resource and assistance. Thousands of volunteers and dozens of voluntary organizations provided assistance to individuals and organizations affected by the earthquake. Three major programs are summarized in this section.

American Red Cross

The American Red Cross provides assistance to victims of natural disasters. The Emergency and Additional Assistance program, provide food and housing for victims, direct cash grants for replacement of personal property, and rental assistance. These programs are funded through donations from throughout the world.

Over $78 million was designated by donors for use in relief of Loma Prieta earthquake victims. As of May 1991, the Emergency and Additional Assistance program provided $24 million to more than 14,000 families. Expenses included serving more than 642,000 meals, providing 126,000 nights of shelter for 69,000 victims in 50 shelters, cash grants for replacement of personal property and rental assistance. These services were provided by over 7,000 volunteers and 40 mobile feeding vehicles.

Following the Loma Prieta earthquake the American Red Cross established new and unique programs funded through the Special Disaster Relief Fund. These programs have assisted nearly 10,000 people through grants to local agencies for 61 collaborative projects for transitional and permanent housing, mental health, employment, and legal and human services. Almost 1,200 housing units are being rehabilitated or constructed. The remaining funds continue to support a Client Advocacy Program (serving more than 2,500 families), disaster planning, and to provide reserves for future earthquake-related needs in Northern California.

The Salvation Army

The Salvation Army serves meals, provides groceries, furniture, medical supplies and clothing to very low income individuals and families.

After the October 1989 earthquake the Salvation Army had spent $5 million within the first 45 days and helped over 227,000 people, served 100,000 meals and provided groceries, clothing, furniture and medical supplies persons and families. The Salvation Army's work with the earthquake victims continues with a particular emphasis on providing transitional housing in Santa Cruz (for older persons) and in Watsonville (for families).

Northern California Grantmakers

Northern California Grantmakers consists of 57 foundations and corporations that contributed more than $19 million for Loma Prieta relief operations. Those contributing above $1 million included the James Irvine Foundation, Pacific Gas and Electric, the San Francisco Foundation, and United Way of the Bay Area. After the earthquake estimates of the total charitable contributions, excluding thousands of volunteer hours, exceed $100 million.

Part 4
Related Responsibilities of State Agencies

The 26 agencies listed in this section carry out activities that contribute to seismic safety in a variety of ways. Although these activities support the seismic safety program, they are not justified as responses to the earthquake threat but are part of each agency's normal affairs. Following the description of each agency's seismic-related activity is listed the earthquake hazards reduction program categories that this activity assists.

Department of Boating and Waterways
The Department of Boating and Waterways reviews the plans for department-funded facilities to insure compliance with current building code seismic standards. Investigations are also conducted to determine if any geotechnical problems may exist at potential project sites. The department is prepared to work with the Office of Emergency Services after an earthquake based on the general participation of all state agencies in the State Emergency Operations Plans. In the case of minimizing destruction to life and property after an earthquake, this department is prepared to evaluate damage related to recreational marine facilities, and provide information about local marine patrol units available to assist in search and rescue activities. Activities of the department assist earthquake hazards reduction program initiatives in Categories 1, 2, and 3.

Building Standards Commission
The commission reviews and approves all proposed building regulations adopted by state departments. The regulations must be approved by the commission before they have any force or effect. The commission is also responsible for codification and publication of all building standards of state agencies into one code, the State Building Standards Code (Title 24, California Administrative Code). Activities of the commission assist initiatives in all Categories.

California Board of Architectural Examiners
Department of Consumer Affairs
The California Board of Architectural Examiners (CBAE) attempts to ensure that all who practice architecture are licensed and qualified to do so. To reduce the possibility of building failure, encourage energy-conscious design, and safeguard public health and welfare, those who represent themselves as skilled in the design of complex structures must meet minimum standards of competency assessed by the CBAE. To become licensed as an architect, a candidate must pass a written and oral examination, as well as provide evidence of at least eight years of education and experience. The written exam includes sections on lateral forces (which tests the candidate's ability to understand the effect of seismic forces on buildings) and building design (which tests the candidate's ability to integrate architectural concepts, including California seismic considerations, into an effective design solution). In the oral interview, the candidate must demonstrate knowledge in the area of seismic forces and its consideration in site planning and design. Activities of the board assist program initiatives in Categories 1, 2, and 4.

Board of Registration for Geologists and Geophysicists
Department of Consumer Affairs
The Board of Registration for Geologists and Geophysicists licenses qualified geologists and geophysicists; develops policies, rules, and regulations; and acts on complaints and violations of the law by licensees and nonlicensees. The board requires that geologists possess the necessary skills and proficiency to (1) conduct investigations of landslides, active faults, earthquakes and land subsidence; (2) conduct investigations of ground water and mineral exploration; and (3) assist civil engineers in the design, construction, and maintenance of civil engineering projects by applying geological principles and by interpretation. Geophysicists possess the skills and proficiency to conduct seismic, magnetic, gravity, or electrical surveys and to interpret ground motion and velocity. Activities of the board assist program initiatives in Categories 1, 2, and 4.

Board of Registration for Professional Engineers
Department of Consumer Affairs
The Board of Registration for Professional Engineers was established in the aftermath of the 1928 St. Francis Dam failure in southern California. To safeguard the life, health, property, and welfare of the public, the state sought to provide for a minimum level of professional competence.

Within the engineering profession, the work of civil and structural engineers has the most effect on seismic safety. To become a registered civil engineer, an applicant must have six years of experience in engineering, of which up to four years of undergraduate study may apply. In addition, an applicant must pass an examination covering fundamental engineering subjects and demonstrate ability to apply his/her knowledge by passing an eight-hour professional examination. Effective January 1, 1988, all civil engineer applicants must pass an additional two-hour examination seismic and engineering surveying principles. An examinee must pass both items to pass the exam. Structural engineers must first meet all registered civil engineer requirements and then pass a 16-hour structural engineer examination. In 1986 the board began to give title distinction to geotechnical engineers. The geotechnical applicant must be a registered civil engineer and have four additional years of experience before he can apply for the eight-hour examination. Activities of the board assist program initiatives in all Categories.

California Environmental Protection Agency
The California Environmental Protection Agency (Cal/EPA) was created in July 1991 as a cabinet level agency responsible for state environmental programs. Cal/EPA includes: 1) three regulatory boards—Air Resources Board, Water Resources Control Board (and its nine regional boards), and Integrated Waste Management Board; 2) two new Departments—the Department of Pesticide Regulation, formerly part of the Department of Food and Agriculture, and the Department of Toxic Substances Control, formerly part of the Department of Health Services; and 3) the Office of Environmental Health Hazard Assessment, formerly part of the Department of Health Services. Cal/EPA's goals include:

- setting risk-based environmental priorities, using the best science available;
- preventing pollution from being created, instead of attempting to control it after the fact;
- using market incentives to encourage environmental progress;
- enforcing environmental laws vigorously and fairly; and
- opening the regulatory process for public participation.

Department of Corrections
In the event of a disaster, the Department of Corrections supplies inmates to support emergency operations, provides congregate care and food, furnishes emergency medical treatment to disaster victims, and assists with the maintenance of law and order. The department constructs, own and maintains over 1,395 prison structures. Activities of the department assist program initiatives in Category 3.

Office of Criminal Justice Planning
The Office of Criminal Justice Planning (OCJP) has expanded the issues of Neighborhood Watch Programs to prepare for earthquakes, floods, fires, and other disasters. The Office of Emergency Services, in cooperation with OCJP, prepared Neighborhood Disaster Preparedness Packages which are disseminated at Neighborhood Watch Program meetings to help communities deal with various kinds of disasters. OCJP included language in the Community Crime Resistance Grants (CCR) encouraging coordination with local and state fire and safety agencies and organizations in their community crime prevention planning. Activities of the office assist program initiatives in Categories 3.

Department of Education
The governing board of each school district and county superintendents of schools are required to develop earthquake emergency procedures and to conduct regular drills in every public and private school building having an occupant capacity of 50 or more students. The Department of Education's role during a disaster includes coordinating the release of emergency public information in accordance with the California Emergency Public Information System and providing use of its school property

and equipment. The Department of Education also provides limited consulting and procedural advice to local school districts on disaster and earthquake planning and site facilities planning. Activities of the department assist five-year program initiatives in Category 1, 2, 3, and 4.

Employment Development Department
The Employment Development Department administers the state's emergency manpower programs in the event of a disaster. Activities of the department assist program initiatives in Category 3.

Department of Finance
The Department of Finance reviews and approves emergency expenditures of state agencies and allocates funds pursuant to the Natural Disaster Assistance Act to local agencies for repair, restoration, or replacement of damage destroyed by a disaster. Activities of the department assist program initiatives in Category 3 and 4.

Department of Fish and Game
The Department of Fish and Game assists in search and rescue operations, provides communications support, provides law enforcement support, and issues and enforces emergency hunting and fishing regulations in the event of a disaster. Activities of the department assist program initiatives in Category 3.

Department of Forestry and Fire Protection
The Department of Forestry and Fire Protection redirects its resources during an emergency to perform the following activities: furnish fire and rescue mutual aid, supervise inmate and ward labor crews assigned to fire and rescue, support emergency feeding program, obtain and report radiological information, and provide communications and warning support to the state emergency organizations. Activities of the department assist program initiatives in Category 3.

Telecommunications Division Department of General Services
The Telecommunications Division provides engineering, maintenance, technical planning, and repair services for state-operated radio and wire communication systems, including acquisition and installation of such systems used by the State Emergency Organization during emergency operations. Activities of the division assist program initiatives in Category 3.

Department of Health Services
The Department of Health Services maintains and operates programs that complement and support the activities of local health agencies controlling hazards, preventing and controlling disease, and providing health services to populations with special needs.
The primary disaster response role of the Department of Health Services is to assist local public and environmental health agencies. In a major disaster, the department will provide environmental health, radiologists, toxic substance control, and communicable disease control assistance necessary to restore and protect the public health in the affected areas. The department also provides support to the Emergency Medical Services Authority in planning for and responding to a major disaster involving mass casualties.

A program devoted to emergency planning began January 1988 under the Office of Emergency Preparedness and Injury Control. The program funds two full-time positions and is budgeted for $170,000. Department activities assist program initiatives in Categories 1, 2, 3, and 4.

State Historical Building Safety Board
The Board promulgates building standards for qualified historical buildings or structures through the State Historical Building Code. The Board acts as an appeals body for interpretation of this code. This code encourages the preservation of qualified historical buildings while providing a reasonable level of structural and life-safety for occupants and the public at large. Board activities assist program initiatives in Categories 1, 3 and 4.

Department of Industrial Relations
The Department of Industrial Relations, Division of Occupational Safety and Health conducts inspections of new and existing elevator equipment to assure conformance with earthquake-related safety orders. These orders include devices that regulate elevator operation and construction features that enhance the equipment's seismic resistance. Approximately one-fourth of one personnel year (.25 PY) is devoted to seismic considerations. Activities of the department assist program initiatives in Categories 1, 2, and 3.

Department of Justice
The Department of Justice furnishes legal advice and assistance to the Governor and to state and local agencies, supports the

communications and warning activity of the Office of Emergency Services, and provides law enforcement mutual aid during a disaster. Activities of the department assist program initiatives in Categories 1, 2, 3, and 4.

California Maritime Academy
In the event of a disaster, the academy assists the Department of Boating and Waterways by providing small craft for emergency operations. The academy also prepares food and furnishes congregate care at the academy's facility and provides a redistribution center for displaced disaster victims. Activities of the academy assist program initiatives in Category 3.

Department of Mental Health
The Department of Mental Health will provide consultation and technical assistance to local mental health agencies in the development and implementation of crisis counseling service programs for disaster victims. In a federally declared disaster, the department will assist the local mental health agencies to apply for federal grants as provided for in the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Section 416, P.L. 100-707). The Department also has training materials available for mental health workers and other disaster response personnel. Activities of the department assist program initiatives in Categories 3 and 4.

Department of Motor Vehicles
In the event of a disaster, the Department of Motor Vehicles (DMV) issues emergency worker identification cards to properly registered disaster service workers. The DMV also provides the Office of Emergency Services with a computer listing of all licensed off-road and heavy equipment vehicles in California that includes vehicle types and the name and address of the registered owners so they can be called upon for assistance in the event of a disaster. Also, after a disaster, the DMV would use its computer to register disaster victims to respond to relatives inquiring about the whereabouts of potential disaster victims. Activities of the department assist program initiatives in Category 3.

Office of Planning and Research
State planning law requires every California city and county to prepare, adopt, and periodically review a comprehensive long-term General Plan for the physical development of that community. One of the mandatory elements in a general plan is a safety element for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, dam failure, slope instability leading to mudslides and landslides, subsidence and other geologic hazards. Seismic hazards are to be mapped and evacuation routes addressed as part of this element.

In accordance with state planning law, the Office of Planning and Research has prepared *General Plan Guidelines*, an advisory document that explains California's requirements for General Plans, taking into account new statutes, case law, Attorney General's opinions, and commonly accepted principles of contemporary planning. Activities of the office assist program initiatives in Categories 1 and 2.

Department of Real Estate
The Department of Real Estate is responsible for enforcing the Real Estate Law and the Subdivided Lands Law for the protection of the public in real estate transactions. The purpose of the Subdivided Lands Law (Sections 11000-11202, Business and Professions Code) is to protect purchasers of subdivided property from fraud, misrepresentation, or deceit in the offering for sale or lease of subdivided lots, parcels, units, and undivided interests in the State of California. Prior to such offering, the subdivider must obtain a subdivision public report from the Real Estate Commissioner and must give a copy to prospective purchasers. The public report is a disclosure document containing a factual description of the subdivided property. Although the Subdivided Lands Law does not give the Department of Real Estate the ability to "disapprove" subdivisions on the basis of seismic factors, possible conditions due to adverse geological factors are normally disclosed in the public report. Activities of the department assist program initiatives in Categories 1, 2 and 4.

Department of Social Services
The Department of Social Services serves as the lead state agency in coordinating mass care and shelter response among several state and federal support agencies and with the American Red Cross. The department's primary focus is to meet the food, clothing and shelter needs of victims when a disaster occurs. The department assists the American Red Cross and the county welfare departments with supplies and personnel for operation of mass care and

shelter facilities once local resources are diminished.

The department is responsible for managing emergency welfare services, including the welfare inquiry program and the emergency food stamp program. These programs help families who have been separated as a result of the earthquake and also assist in the transition from mass care to separate family living. In the post-disaster stage, the department administers the Individual and Family Grant Program (IFGP). This program, funded by both federal (75 percent) and state (25 percent) governments, provides funds to disaster victims who have serious unmet needs as defined by federal guidelines.

The department participates with federal, state and local agencies in emergency exercises and plans that seek to improve their ability to meet the challenges a major earthquake or disaster would present to the state. Activities of the department assist program initiatives in Categories 3.

Office of the State Fire Marshal
The State Fire Marshal enforces fire and panic safety standards for all educational, health care, and public assembly occupancies; organized camps; and public assembly, high-rise, and state-owned and state-occupied buildings. While fire and panic safety are broad areas that do not directly involve seismic safety, they become important considerations in the case of fire following an earthquake. The .i.State Fire Marshal; reviews and approves design drawings and specifications and conducts field inspections of public schools and certain public buildings. Fire and panic regulations are developed with comment and counsel from code-writing authorities to consider the impact of catastrophic incidents such as earthquake, flood, or other natural disasters. Activities of the office assist five-year program initiatives in Categories 1, 2, 3, and 4.

California State University System
The 20-campus California State University (CSU) system provides instruction in the liberal arts and sciences as well as in applied fields that require more than two years of college education. Eighty-five percent of the teachers in California receive their training through the system. The system's curriculum includes instruction for engineers and geologists. The System owns and operates over 1000 buildings and is involved in a retrofit program. Activities of the CSU system assist program initiatives in all Categories.

University of California
The University of California which includes eight general campuses and one health science campus, is the primary state-supported academic institution for research in California. It has sole authority among public higher education institutions to award doctoral degrees in all disciplines, although it also may award doctoral degrees with the California State University.

The University contributes to improvement of seismic safety by conducting research and by training students at all levels in disciplines that directly affect earthquake issues. Seismic safety is part of UC's curriculum in disciplines such as engineering, geology, geophysics, and architecture. The University also owns and operates over 1000 buildings and is carrying out a a retrofit program. Activities of UC assist program initiatives in all categories.

Department of Youth Authority
The Youth Authority provides ward camp crews to assist in emergency operations, provides congregate care at its department facilities, prepares food, and furnishes emergency medical treatment to disaster victims. Department activities assist program initiatives in Category 3. It owns and operates buildings.

Appendix B

Report on the First *California at Risk* Program

Summary Of *California at Risk* 1987-1992

The California Earthquake Hazard Reduction Act of 1986 called for a long-term strategic hazard reduction program to guide efforts of the State of California. The legislation was sponsored by the Seismic Safety Commission, carried by Senators Alquist and Campbell, and signed into law by Governor Deukmejian in 1985. The Act recognized that responsibilities for seismic safety were shared by government agencies at all levels and the private sector as well, and that while it was not feasible to create a centralized, tightly controlled program, it was necessary to create a vision of where all the players should be headed, and develop a process of persuasion that would encourage voluntary action. The Act established a clear goal: To significantly reduce statewide seismic hazards by the end of the century. It also recognized that reaching this goal would require comprehensive objectives that addressed hazard mitigation, emergency planning and response, and recovery planning. The Act called on the Commission to prepare and administer the program.

Over forty agencies share responsibility for state level earthquake activities and the Legislature and Governor share responsibility to establish earthquake safety policy for all Californians. The program recognizes that in spite of shared responsibilities, each agency has other responsibilities that demanded time and resources, and that earthquake activities often were delayed while management paid attention to competing issues of immediate concern. lt also recognized that state government is diffuse and that it is rare when strong direction is given to require or convince those with differing political agenda, private concerns, or turf at risk to pull together for a common goal.

The Commission hired a consultant with an expert team of advisors and used a planning process that called on about 100 additional experts from the private sector, local, state and federal government, private practice and university research to identify what needed to be done and to comment on drafts. The Commission, a multi-disciplinary body consisting of 17 commissioners and 12 staff persons, held numerous public discussions as the program was written.

The initial program developed by the Commission was intended to provide a description of the work ahead, illustrate how each agency and organization is involved, and clarify the steps needed. It consists of text materials that provide the background and perspective needed to help decision makers understand the context of the program recommendations.Its heart was seventy two "initiatives," or broad statements of what was needed to be done with some of the tasks that needed to be done identified as milestones. If the program was to provide a vision of what was needed to be done, the vision was more of a painting done in broad strokes than a photograph with fine detail. While the details were left for later, each new initiative was given credibility and legitimacy and perspective by being part of an integrated and official program.

During the initial five years of the program, California experienced two damaging earthquakes. The Whittier Narrows event in 1987 was followed in 1989 by the devastating Loma Prieta earthquake. Both of these events provided dramatic proof of the continuing need for everyone in California to become better prepared for the certainty of future damaging earthquakes. At the same time, these two earthquakes convincingly demonstrated that the actions identified by the program were directly on target and must be implemented as quickly as possible.

Program Progress

The annual program report, *California at Risk,* is a catalog of state activities that

directly or indirectly contribute to seismic safety while simultaneously describing the actions the state should take to mitigate these earthquake hazards.

California at Risk is an advisory document only and not directive upon any governmental agency or private organization. These initiatives present each step containing a dated milestone with the appropriate lead or support state agencies identified. Implementation is through voluntary actions and to be successfully adopted, the program has had to recognize financial, bureaucratic and political realities; financial; no state mandates can be imposed that would require the state to fund noncritical immediate actions—bureaucratic; there were 43 different state agencies involved on the interagency earthquake policy coordinating committee, and local agencies and private sector organizations are also involved in the implementation of the initiatives—political; each initiative may evolve into legislation to achieve implementation that will either be sponsored or supported by the Commission. The first program for 1987-1992 had 72 initiatives.

The most serious problem faced, and the one most difficult to resolve, is how to fund the needed mitigation actions. It will take billions of dollars and many years to make the recommended seismic safety retrofits to the state's existing stock of hazardous bridges and buildings. Local governments face a similar requirement for funds as well and it will take them years to make the improvements necessary to mitigate their existing hazards. At the same time, government is faced with the problem of taking steps to avoid creating new hazards that will add to the already immense financial burden required to mitigate existing hazards.

A major concern with any multi-agency program is how to know when progress has been made. In *California at Risk*, progress is determined by three actions: 1) when initiatives become part of an agency's funded program, 2) when they receive priority in an agency's budget to be started, or 3) when they have had legislation passed to direct implementation. In the final analysis, however, the program has been most successful either through legislation or when the initiatives involved actions that were already part of an agency's primary responsibilities.

A significant role played by the Seismic Safety Commission has been to be part of a system of checks and balances as well as to be the advocate for seismic safety efforts. After the Loma Prieta earthquake, the Governor issued Executive Order D-86-90 directing the Department of Transportation, the Department of General Services, the University of California, and the California State University system to make seismic safety a priority consideration for state structures and to report on their plans and procedures developed to carry out this mandate. The Executive Order simultaneously required the Seismic Safety Commission to report to the Governor on the adequacy of the agencies' responses to the Executive Order. *California at Risk* included 11 initiatives that proposed seismic safety improvements for governmental buildings, structures and educational buildings that involved these issues. The Commission found that problems within these four agencies were typical of the problems encountered by the state agencies in implementing the initiatives from *California at Risk*. Frequently agencies not only lacked funds to implement initiatives, they also lacked a clearly assigned internal priority to carry out hazards reduction initiatives and lacked a management accountability for the program results.

Earthquake issues cut across organizational boundaries and require considerable interaction between agencies and organizations to be successful. Many agencies would not normally interact with each other if it weren't for earthquakes. But learning about seismic safety efforts of other groups has unexpected benefits. Representatives in the Interagency Committee learn about a wide variety of seismic safety efforts, and they get an overview of the technical, organizational and political issues involved. In some cases, learning about issues before an earthquake has sensitized representatives and perhaps whole groups to the problems that others are likely to encounter after an earthquake.

When one agency happens to be first on the scene after an earthquake, knowledge of other state programs and the use of interagency contacts can help people get in touch with the appropriate help.

The state legislature has been an active user of the *California at Risk* report. Following the Whittier Narrows earthquake on October 1987 the legislature became acquainted with *California at Risk* and introduced 11 bills dealing with 9 of the initiatives in the 1988 session. A total of 5 bills were enrolled in the 1988 session, 2 of the bills were resolutions which were chaptered and the remaining 3 bills were vetoed by the Governor.

Three months after the close of the 1988 session the awareness of the Legislature and the Governor was once again heightened by the Armenian Earthquake in December of 1988. A total of 31 bills were introduced by the Legislature in 1989 dealing with seismic safety issues. Of those, 20 bills addressed different aspects of the 72 initiatives in *California at Risk*. The Commission sponsored 8 of the 20 bills and used the report to support staff discussions with the Legislators and Committee staff. In addition, Commission responses to legislators and their staff provided copies of *California at Risk* and this resulted in the other 12 bills being introduced.

By the end of the 1989 session, 25 of the 31 bills introduced were enrolled and sent to the Governor. Governor Deukmejian ultimately signed 21 of the 25 bills into law. In the summer of 1989 following the Armenian Earthquake, Governor George Deukmejian prepared a list of major seismic safety initiatives to pursue in his closing year as governor. Ten out of eleven of these were drawn directly or partially from *California at Risk*.

Seventeen days after the bills of the 1989 session were chaptered into law, the Loma Prieta Earthquake occurred. In January 1990, the Seismic Safety Commission, in cooperation with the Earthquake Engineering Research Institute, offered a seminar for the legislative staff on important seismic safety issues that were recommended for legislative consideration. This seminar summarized many of the initiatives in *California at Risk*. Eventually 307 seismic-related bills were introduced in the weeks following this seminar. For 1989 and 1990, during the two-year period of regular and special sessions, a total of 443 bills and resolutions were introduced that included the term "seismic safety" or "earthquake." 312 of these bills dealt directly with seismic safety issues. When the 1990 session finally closed, a total of 164 had been enrolled and sent to the Governor for his signature. Of these, 137 bills and resolutions became law, making this period the single most productive legislative period ever encountered for seismic safety legislation. For comparison, only a total of 112 bills had been signed into law in all the years between the great 1906 San Francisco earthquake and the Loma Prieta earthquake in 1989.

The legislative year 1991 continued the emphasis from the previous year. Of the 14 seismic safety bills sponsored by the Commission, eight were chaptered. Two bills required residential and commercial property owners to disclose potential seismic defects upon sale of the property. Other significant statute additions established retrofit standards for URM buildings and initiated action to provide funding for research proposals in the Commission's Earthquake Research Plan. This legislative activity has established a solid foundation for the continued efforts of the second five-year program. The effect of this legislation has not yet been realized. Fifteen new activities and 31 changes to existing seismic safety activities were made by legislation. These new responsibilities have not been implemented. As these new activities become operational, public safety improvements should occur.

Status of Initiatives

Of the 72 initiatives that comprise the program 56 were underway at the end of the five years. Table B–1 lists these initiatives, the lead agency responsible for implementing them, when each one was scheduled to start and whether it was actually started. The final column describes the status of the initiative as the second five-year program begins.

It must be strongly emphasized that earthquake mitigation initiatives are direct

public safety issues and can not be considered as a routine order of business. And it must also be remembered that seismic safety actions generally require significant time before the desired safety improvements begin to actually benefit the public. The unreinforced masonry buildings program demonstrates this point. Legislation was passed in 1986 requiring local governments to take action to mitigate the hazards of unreinforced masonry buildings in Seismic Zone 4 and report their actions to the Seismic Safety Commission. Since that time most of the jurisdictions have established hazard mitigation programs, however, the actual retrofit of these buildings will require many more years before the hazards will be substantially reduced. This emphasizes the need to get the initiatives into operation quickly and begin producing results.

It will take commitment by decision-makers at all levels—state, local, and private sector—to reach goals of the program: to significantly reduce earthquake hazards by the year 2000.

Table B–1—Status of Initiatives, 1987-1992

No.	*Title*	*Lead Agency*	*Scheduled Start*	*Status*	*Cross Reference to California at Risk 1992-1997*
	Category 1—Existing Development				
1.1	Unreinforced Masonry Buildings	SSC	1986	Started	Appendix A
1.2	Pre-Hospital Act Structures	OSHPD	1989	Started	Initiative 1.2
1.3	Mobile Home Foundations	HCD	1989	Started	Initiative 1.6
1.4	Early Public School Buildings	OSA	1989	Started	Initiative 1.3
1.5	State-owned Buildings	OSA	1990	Started	Initiative 1.4
1.6	Hazard Reduction Incentives	SSC	1991	Started	Initiative 4.3
1.7	Retrofit Hazardous Buildings	BSC	1989	Started	Initiative 1.7
1.8	Low-cost Retrofit Loans	SSC	1987	Started	Dropped
1.9	High-Occupancy	SSC	1991	Started	Initiative 1.7
1.10	Essential Services Facilities	OES	1989	Started	Initiative 1.5
1.11	Identify Residential Hazards	SSC	1989	Started	Initiative 1.8
1.12	Building Retrofit Standards	BSC	1989	Started	Initiative 1.1
1.13	Reduce Bldg Contents Hazards	SSC	1989	Not Started	Initiative 1.9
1.14	Hazardous Private Schools	SSC	1989	Dropped	
1.15	Structures w/Hazardous Mat'ls	OES	1989	Started	Appendix A
1.16	Utility Systems	PUC	1989	Started	Initiative 1.12
1.17	Transportation Structures	Caltrans	1988	Started	Appendix A
1.18	Federal Dam/Review	DWR	1990	Not Started	Initiative 1.10
1.19	Appendages to Structures	SSC	1988	Not Started	Initiative 1.15
1.20	Local Government Financing	SSC	1988	Started	Initiative 4.1
1.21	Community Medical Clinics	SSC	1989	Started	Initiative 3.6
1.22	Public and Private Colleges	SSC	1990	Dropped	
1.23	Preserve Historic Buildings	SHBSB	1988	Started	Dropped
1.24	Retrofit Liability	SSC	1989	Started	Initiative 1.11
	Category 2— Emergency Planning and Response				
2.1	Emergency Planning	OES	1986	Started	Part 1
2.2	Emergency Operations Centers	OES	1986	Started	Part 1
2.3	Short-term Prediction Response	OES	1986	Started	Dropped
2.4	Info Management System	OES	1986	Started	Part 1
2.5	Communications System	OES	1987	Started	Initiative 3.1
2.6	Urban Heavy Search and Rescue	OES	1987	Started	Part 1
2.7	Tests and Exercises	OES	1987	Started	Part 1
2.8	Mutual Aid Agreements	OES	1986	Started	Initiative 3.3
2.9	Emergency Response Training	OES	1988	Started	Part 1
2.10	Damage Scenario	OES	1988	Started	Part 1
2.11	Structural Hazards Appraisal	OES	1989	Started	Started
2.12	Building Manager Training	SFM	1988	Started	Part 1
2.13	Operations Area Concept	OES	1989	Started	Initiative 3.2

No.	Title	Lead Agency	Scheduled Start	Status	Crossreference to California at Risk 1992-1996
	Category 3—Future Development				
3.1	New Private Schools	SSC	1987	Started	Initiative 2.1
3.2	Local General Plan Review	SSC	1989	Started	
3.3	Subdivision Hazard Review	SSC	1987	Started	
3.4	Urban Geo. Hazards Mapping	DOC	1987	Started	Initiative 2.2
3.5	Fault Zones Mapping	DOC	1989	Started	Initiative 2.2
3.6	Training of Professionals	SSC	1986	Started	Initiative 2.5
3.7	Inspection and Peer Review	BSC	1989	Started	Initiative 2.3
3.8	State Design Review Agencies	BSC	1989	Started	Initiative 2.4
3.9	Refine Bldg Performance Stnds	SSC	1989	Started	Initiative 2.1
3.10	Improve Building Code	SSC	1989	Started	Initiative 2.1
	Category 4—Recovery				
4.1	Recovery Program	SSC	1986	Not Started	Initiative 4.1
4.2	Review Earthquake Insurance	DI	1987	Started	Part 1
4.3	Effects on State Government	SSC	1989	Not Started	Initiative 4.2
4.4	Effects on State Economy	SSC	1989	Not Started	Initiative 4.2
4.5	Mental Health	DMH	1988	Started	Part 1
4.6	Insurance Incentives	DI	1988	Started	Initiative 4.3
4.7	Recovery Strategy	SSC	1992	Not Started	Initiative 4.1
4.8	Damage Assessment Standards	OES	1989	Started	
4.9	Rubble Disposal Strategy	BCDC	1989	Not Started	Initiative 4.4
	Category 5—Education and Public Information				
5.1	Earthquake Preparedness Campaign	OES	1986	Started	Part 1
5.2	Model Curricula	SSC	1986	Started	Part 1
5.3	School Preparedness	SSC	1986	Started	Part 1
5.4	Regional Projects	OES	1988	Started	Part 1
5.5	Employee Information	SSC	1989	Not Started	Initiative 1.15
5.6	Volunteer Training	OES	1987	Started	Part 1
5.7	Teacher Training	Colleges	1989	Not Started	Part 1
5.8	School Safety Officers Training	DOE	1989	Started	Dropped
5.9	College, Preschool Preparedness	PEC	1988	Not Started	Part 1
5.10	Earthquake Resource Centers	DOE	1992	Not Started	Part 1
	Category 6—Research				
6.1	Earthquake Research Program	SSC	1989	Started	Initiative 5.1
6.2	Earthquake Early Warning	DOC	1986	Started	Part 1
6.3	Strong Motion Program	DOC	1987	Started	Part 1
6.4	Five-Year Research Plan	SSC	1988	Started	Initiative 5.1
6.5	Review of Federal Research	SSC	1989	Not Started	Initiative 5.1
6.6	Initiate Research Plan	SSC	1988	Not Started	Initiative 5.1

Key:

BCDC ..... San Francisco Bay Conservation and Development Commission
BSC..... Building Standards Commission
CalOSHA.... California Occupational Safety and Health Administration
Caltrans..... Department of Transportation
DHS..... Department of Health Services
DI Department of Insurance
DMH ..... Department of Mental Health
DOC..... Department of Conservation, Division of Mines and Geology
DOE ..... Department of Education
DWR ..... Department of Water Resources
SFM..... State Fire Marshal
HCD ..... Department of Housing and Community Development
OES ..... Governor's Office of Emergency Services
OSA ..... Office of State Architect
OSHPD ..... Office of Statewide Health Planning and Development
PEC ..... Postsecondary Education Commission
PUC ..... Public Utilities Commission
SHBSB ..... State Historical Building Safety Board
SSC ..... Seismic Safety Commission

Appendix C

Legislation: The Last Five Years

The Commission submitted its first five-year earthquake hazard reduction program to the Legislature in January 1987. Since then, it served as an outline for legislation during every session including the 1991 session. The Legislature passed, and governors signed, more earthquake safety legislation during the last five years than ever before in California's history. This appendix summarized the legislation passed by the Legislature during those years.

During the 1987-1988 legislative session, including the extraordinary session called because of the Whittier Narrows earthquake, 23 bills were introduced, eleven were enrolled and forwarded to Governor Deukmejian and six were signed into law. During the 1989-1990 legislative session, including the 1989 extraordinary session called because of the Loma Prieta earthquake, 443 bills and resolutions were introduced that included the terms "seismic safety" or "earthquake." Three hundred and twelve addressed seismic safety and disaster recovery issues. Of the 443 bills, 164 were enrolled and submitted to Governor Deukmejian, 137 were signed into law. Seismic safety legislation remained an important topic in the 1991-1992 legislative session. During 1990, the first year of the two year session, 139 bills were introduced, 63 were enrolled and submitted to Governor Wilson, and 55 were signed into law.

Legislation passed, or "enrolled," by the Legislature during the 1987-1991 period is summarized in this appendix. The term "chaptered" means the measure became law. The chapter number denotes the year and the numerical designation of the new statute. Enrolled bills rejected by the governor are noted as "vetoed." Since resolutions do not require action by the Governor, they are shown as "passed."

Category 1—Existing Vulnerable Facilities

Bill No.	Author	Description	Status
AB 29	Klehs	Makes nonsubstantive technical amendments to existing seismic safety statutes affecting the Homeowners Guide to Earthquake Safety by adding tsunami and seiche inundation maps to the Seismic Hazard Mapping Program.	Chaptered 91-550
AB 43	Floyd	Exempts seismic retrofit and rehabilitation from property tax reassessment (also see SCA 33).	Chaptered 91-0008
AB 143	O'Connell	Allows community facilities districts to finance the acquisition, improvement, and rehabilitation of real property in order to clean up hazardous substances.	Chaptered 91-0029
AB 160	Polanco	Modifies the property tax computation formula of redevelopment agencies affected by the Loma Prieta earthquake.	Chaptered 90-449
AB 200	Cortese	Requires the seller of any pre-1960 residence to disclose to the purchaser the seismic defects of the home as defined within The Homeowner's Guide to Earthquake Safety.	Chaptered 91-0699
AB 204	Cortese	Adds Appendix Chapter 1 of the Uniform Code for Building Conservation as a model code for unreinforced masonry buildings.	Chaptered 91-0173
AB 247	Cortese	Recodifies existing seismic safety statutes.	Chaptered 91-0188
AB 315	Friedman	Requires community redevelopment districts to allocate at least 20 percent of their property tax revenue to low- and moderate- income housing.	Chaptered 91-0872
AB 524	Bronzan	Requires health facilities to report specific patient discharge information to the Office of Statewide Health Planning for inclusion in risk adjustment reports.	Chaptered 91-1075
AB 766	Frazee	Establishes the Architects Practice Act and renames the California State Board of Architectural Examiners to "The California Board of Architectural Examiners."	Chaptered 91-0566
AB 810	Costa	Amends the "Rosenthal Bond Act of 1982" by redefining the term "eligible buildings" for the purposes of retrofitting unreinforced masonry buildings.	Chaptered 89-756
AB 818	Areias	Establishes the bridge inventory program within the Department of Transportation to review the safety of existing bridges.	Chaptered 89-605
AB 915	Eaves	Expands the existing engineer recruitment and retention program within the Department of Transportation.	Chaptered 91-030

Category 1—Existing Vulnerable Facilities (continued)

Bill No.	Author	Description	Status
AB 981	Katz	Allows the Department of Transportation to use short-term financing to fund seismic safety retrofit projects.	Chaptered 91-0194
AB 994	Speier	Exempts regional occupational programs from the "Field Act."	Vetoed, 1990
AB 1001	Brown	Expands the purposes for which a city or county may issue municipal bonds to include the seismic retrofit and strengthening of unreinforced masonry buildings.	Chaptered 91-0658
AB 1091	Klehs	Amends the real estate disclosure requirements of the Seismic Hazards Mapping Program by adding additional disclosure requirements.	Chaptered 91-0250
AB 1139	Waters, N.	Specific "Field Act" exemptions for Tahoe Community College and for the Lodi Unified School District.	Chaptered 89-217
AB 1279	Hauser	Provides local government authority for the abatement of potentially hazardous buildings.	Chaptered 90-192
AB 1296	Filante	Authorizes the California Department of Housing and Community Development to adopt emergency regulations for the implementation of Proposition 84.	Chaptered 89-1103
AB 1497	Hauser	Establishes a commercial unreinforced masonry loan guarantee program.	Vetoed
AB 1505	Farr	Establishes procedures for the creation of County Service Areas and creates funding sources.	Vetoed, 1991
AB 1756	Speier	Disallows expenses derived from substandard housing as personal income tax deductions.	Chaptered 91-0603
AB 1788	Bane	Appropriates $10,000,000 for the retrofit and rehabilitation of the state office building located at 1020 N Street in Sacramento.	Chaptered 91-0206
AB 1890	Cortese	Requires all new and replacement water heaters sold in California to be bolted, braced or strapped to resist earthquakes.	Chaptered 89-951

Category 1—Existing Vulnerable Facilities (continued)

Bill No.	Author	Description	Status
AB 1929	Hughes	Requires city and county 5-year plans to meet housing needs and allows these plans to mitigate the loss of dwelling units demolished by the public and private sector.	Chaptered 91-0730
AB 1964	Areias	Establishes a goal for the state of California to retrofit or vacate all state owned or leased unreinforced masonry buildings by 2005.	Vetoed, 1991
AB 1968	Areias	Requires the Seismic Safety Commission to develop, adopt and publish a Commercial Owner's Guide to Earthquake Safety to be distributed by realtors.	Chaptered 91-0859
AB 2081	Jones	Requires the Office of Statewide Health Planning and Development to include an assessment of small and rural hospitals pilot projects in their report on the impact of emergency regulations that wave or modify regulatory requirements	Chaptered 91-0210
AB 2190	Frazee	Consolidates and makes technical amendments to the Contractors' State Licensing Law.	Chaptered 91-1160
AB 2627	Moore	Requires insurers to clearly disclose deductibles for residential earthquake insurance.	Chaptered 90-1167
AB 2791	Speier	Requires demolition permit applicants to have proof of notifying the United States Environmental Protection Agency of asbestos.	Chaptered 90-418
AB 2959	Klehs	Requires the Seismic Safety Commission to develop, adopt and publish the "Homeowners Guide to Earthquake Preparedness."	Chaptered 90-1499
AB 3111	Filante	Provides owners of transportable classrooms with a three year exemption from Field Act requirements.	Chaptered 90-1465
AB 3209	Costa	Amends the "Rosenthal Bond Act of 1982" to allow local jurisdictions to pay off any existing debt which may be a lien against the property prior to retrofitting an existing unreinforced masonry building.	Chaptered 89-756
AB 3313	Woodruff	Requires the University of California and California State University systems and the Office of the State Architect to develop seismic retrofit building standards for university and state-owned buildings.	Chaptered 90-1511

Category 1—Existing Vulnerable Facilities (continued)

Bill No.	Author	Description	Status
AB 3556	Cortese	Allows redevelopment agencies to renegotiate their base property tax increment for the purposes of performing seismic retrofit improvements.	Chaptered 90-933
AB 3561	Cortese	Requires all homes in Seismic Zone 4 to be brought into compliance with the anchor bolt and cripple wall requirements of the Uniform Building Code prior to the sale or transfer of the home.	Vetoed, 1990
AB 3846	Roybal-Allard	Requires the development of model seismic retrofit standards for schools.	Vetoed
AB 4333	Quackenbush	Appropriates $24,000,000 from the Proposition 122 fund for the repair of state-owned buildings damaged by the Loma Prieta earthquake.	Chaptered 90-1339
ABx 9	Epple	Establishes uniform "no fault" procedures for filing a claim against the State as a result of the collapse of the Fan Francisco Bay Bridge and the I-880 Cypress structure.	Chaptered 90-36x
ACR 9	Katz	Designates April as Earthquake Preparedness Month	Chaptered 91-r-014
AJR 3	Kelley	Requests the President and Congress of the United States to direct the Secretary of the Navy to repair the Lake Norconian Dam.	Chaptered 89-R-44
SB 120	Davis	Requires community facilities districts wishing to levy a special tax to submit the question to the electorate.	Chaptered 91-0023
SB 122	Greene, L.	Allows local building departments to use the Uniform Building Code instead of Title 24 of the State Administrative Code when checking drawings and plans for essential services buildings.	Chaptered 90-72
SB 147	Hart	The Higher Education Facilities Bond Act of 1990 (Proposition 121). A portion of the funds could be used by the California State University and University of California to seismic retrofit campus buildings.	Chaptered 90-6 Rejected by electorate.
SB 153	Craven	Provides for the certification of interior designers and excludes the design and performance of structural systems from the scope of their practice.	Chaptered 90-396
SB 162	Greene, L	Makes technical changes to remove erroneous references to existing law dealing with local agencies and housing redevelopment projects.	Chaptered 91-0100

Category 1—Existing Vulnerable Facilities (continued)

Bill No.	Author	Description	Status
SB 236	Presley	Exempts all city and county correctional treatment centers from the Hospital Seismic Safety Act.	Chaptered 89-1327
SB 282	Greene, L	Increases the maximum amount the allocation board may charge schools for the lease of transportable classrooms from $2,000 to $4,000.	Chaptered 91-0333
SB 286	Mello	Requires the Santa Cruz County Auditor to recalculate the property tax increment for the cities of Santa Cruz and Watsonville.	Chaptered 91-0078
SB 424	Alquist	Creates the Unreinforced Masonry Loan Guarantee Program.	Chaptered 89-1203
SB 460	Killea	Authorizes the California Transportation Commission to use short-term financing to mitigate delays in the reconstruction of highways damaged by the Loma Prieta earthquake.	Chaptered 91-0195
SB 821	Vuich	Provides for the "Field Act" exemption of adult education classes at state university campuses.	Chaptered 89-916
SB 920	Rogers	Requires the Seismic Safety Commission, in cooperation with the Office of the State Architect, to develop a state policy of acceptable levels of earthquake risk.	Chaptered 89-988
SB 1019	Greene, L	Requires cities and counties to include regional housing needs within the housing element of their general plans.	Chaptered 91-0889
SB 1088	Mello	Allows community facilities districts to finance the seismic repair or retrofit of their buildings and facilities.	Vetoed
SB 1250	Torres	Creates the Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990 (Proposition 122) in the amount of $300,000,000.	Chaptered 90-23 Passed by electorate.
SB 1293	Maddy	Requires the Office of Statewide Health Planning and Development to inventory all existing health facilities and develop a Rural Hospital Grant Program.	Chaptered 89-898
SB 1949	Rogers	Provides that the notification of hearings for the formation of geologic hazard abatement districts can be made via first-class mail.	Chaptered 90-128
SB 2104	Kopp	Requires the Department of Transportation to inventory all state-owned bridges which are in need of seismic repair and to submit a long-term retrofit plan to the legislature.	Chaptered 90-265

Category 1—Existing Vulnerable Facilities (continued)

Bill No.	Author	Description	Status
SB 2453	Maddy	Requires surgical clinics and ambulatory surgical centers to anchor medical equipment to prevent its falling or overturning during an earthquake.	Chaptered 90-1579
SB 2456	Keene	Creates the California Housing Bond Act of 1990 (Proposition 145).	Chaptered 90-577 Rejected by the electorate.
SB 2775	Torres	Removes the sunset date of the State Historical Building Code Board and renames the board "The State Historical Building Safety Board."	Chaptered 90-625
SB 2819	Robbins	Affirms that seismic safety and fire sprinkler improvements made by public entities to privately owned buildings are the property of the private owner.	Chaptered 90-1318
SBx 27	Mello	Requires community facilities districts to pay for any work necessary to bring their buildings into compliance with seismic safety standards, including the replacement or repair of buildings damaged in the Loma Prieta Earthquake.	Chaptered 90-29x
SCA 33	Rogers	Amends Article XIII A of the Constitution to exclude seismic rehabilitation from reassessment on the property taxes (Proposition 127) rolls (see AB 43, Chapter 8, Statutes of 1991).	Chaptered 90-R-57 Passed by the electorate.
AJR 64	Filante	Requests the President and Congress of the United States to carefully study and consider a residential earthquake insurance program.	Chaptered 90-R-86

Category 2—New Facilities

Bill No.	Author	Description	Status
AB 47	Bader	Allows the State Allocation Board to purchase portable classrooms without the approval of any other state agency.	Chaptered 89-667
AB 47	Eastin	Requires the Office of the State Architect to report directly to the Department of General Services and transfers certain plan checking duties to the Office of Statewide Health Planning and Development.	Chaptered 91-0865

Category 2—New Facilities (continued)

Bill No.	Author	Description	Status
AB 225	Areias	Requires the Building Standards Commission to adopt state building standards and regulations to establish procedures for review, validation and publication by December 31, 1992.	Vetoed, 1991
AB 416	Floyd	Allows a building owner to make life safety and seismic safety improvements without bringing the entire building up to current building code requirements.	Vetoed, 1991
AB 631	Bradley	Requires the California Department of Housing and Community Development to develop and adopt regulations governing the installation and inspection of mobilehomes.	Chaptered 89-304
AB 800	Frazee	Requires all public agencies to verify the license of a building contractor prior to the award of any public contract.	Chaptered 91-0785
AB 890	Cortese	Requires local agencies to consult with the California Division of Mines and Geology on the update of the safety element of their general plans.	Chaptered 89-1255
AB 958	Areias	Directs the Seismic Safety Commission to administer a privately funded task force to consider the development of seismic safety building guidelines for use by state and local government agencies in evaluating applications for the construction of new cellular facilities.	Chaptered 91-813
AB 1039	Mays	Requires the Office of Statewide Health Planning and Development to issue a written citation to the hospital, including the proper code or statute being violated, if they find a violation which requires correction.	Chaptered 91-0864
AB 1230	Hansen	Requires the Office of Statewide Health Planning and Development to approve various classes of construction inspectors, such as mechanical and structural.	Chaptered 91-0863
AB 1428	Gotch	Requires the issuance of a permit for the replacement of any structure destroyed by a natural disaster within a coastal development area.	Vetoed, 1991

Category 2—New Facilities (continued)

Bill No.	Author	Description	Status
AB 1469	Lempert	Exempts regional occupational centers and programs from the requirements of the "Field Act."	Chaptered 91-65
AB 1895	Bradley	Defines the Uniform Fire Code of the International Conference of Building Officials and Western Fire Chiefs Association as a "Model Code."	Chaptered 89-952
AB 2347	Kelley	Exempts outpatient clinics and free-standing facilities from the requirements of the Hospital Seismic Safety Act.	Chaptered 89-1050
AB 2565	Eastin	Consolidates school and hospital plan checking programs in southern California to analyze location.	Chaptered 90-1650
AB 2566	Eastin	Requires the Office of the State Architect to establish a working group of state officials to develop a computer tracking system for state plan checking.	Vetoed
AB 2666	Hansen	Requires local building standards for fire safety to be consistent with the State Building Standards Code.	Chaptered 90-1111
AB 3003	Bader	Requires at least 30 percent of all new school facilities to be transportable classrooms.	Chaptered 90-1221
AB 4082	Chandler	Appropriates $200,000 to the State Building Standards Commission for the adoption and publication of the 1991 Triennial Edition of the State Building Standards Code.	Chaptered 90-1289
SB 122	Greene, L.	Allows local building departments to use the Uniform Building Code instead of Title 24 of the State Administrative Code when checking drawings and plans for essential services buildings.	Chaptered 90-72
SB 131	Greene, L.	Reduces the repayment requirements of school districts on school facilities funding.	Vetoed
SB 419	Greene, L.	Allows agencies to select an architect or engineer for a public contract based upon his or her demonstrated competence.	Chaptered 89-293
SB 423	Stirling	Requires soil reports be filed with the city engineer.	Chaptered 89-133

Category 2—New Facilities (continued)

Bill No.	Author	Description	Status
SB 691	Alquist	Requires the Building Standards Commission to conduct a study regarding the feasibility of establishing a single agency to administer and formulate building standards.	Vetoed
SB 850	Dills	Renames the "Hospital Seismic Safety Act" the "Alfred E. Alquist Hospital Facilities Seismic Safety Act of 1983."	Chaptered 89-396
SB 1593	Alquist	Establishes minimum construction and licensure standards for surgical clinics.	Chaptered 89-1001
SB 1825	Beverly	Requires the Department of Finance to prepare a report on what the state's capital outlay and infrastructure needs will be by the year 2000.	Chaptered 90-1435
SB 1830	Green, C.	Requires building standards, rules and regulations adopted by the State Fire Martial to be consistent with the Building Standards Code.	Chaptered 90-1083
SB 2032	Greene, L.	Requires the State Board of Registration for Professional Engineers and Land Surveyors to establish fees, procedures and an appeal process for engineers and land surveyors whose licenses have expired.	Chaptered 90-545
SB 2126	Ayala	Requires the certification and continuing education of local government construction and building inspectors.	Vetoed
SB 2323	Maddy	Requires the Office of Statewide Health Planning and Development to adopt and enforce building standards for freestanding facilities housing outpatient hospital services.	Chaptered 90-1051
SB 2503	Greene, L.	Clarifies that the civil engineer exam will test the applicant's knowledge of seismic principles.	Vetoed
SB 2780	Greene, L.	Authorizes the Director of General Services to make up to $35,000,000 available for the purchase and lease of transportable classrooms.	Vetoed

Category 3—Emergency Management and Response

Bill No.	Author	Description	Status
AB 402	Roybal-Allard	Provides for licensure exemptions for out of state medical health professionals during a disaster.	Chaptered 89-97
AB 697	Roybal-Allard	Designates the Department of Education as the lead agency for the development and coordination of plans and procedures for earthquake awareness, disaster plans, and hazard reduction programs for public schools.	Chaptered 89-643
AB 779	Eastin	Creates a State Emergency Response Team that focuses upon the recovery of state operations following a disaster.	Chaptered 90-1210
AB 957	Areias	Requires the Office of Emergency Services to develop model disaster registry guidelines for use by local government agencies and organizations.	Chaptered 91-0366
AB 1390	Kelley	Allows the Emergency Medical Services Authority and the Director of Health Services to establish a regional disaster medical and health coordinator.	Chaptered 89-185
AB 1791	Becerra	Establishes the California Disaster Response and Recovery Training Program to develop emergency management model plans for urban and rural school districts.	Vetoed, 1991
AB 1966	Areias	Allows the Governor to temporarily suspend orders, rules, regulations, statutes or nonsafety restrictions on the delivery of food products, pharmaceuticals or other needed emergency supplies during a state of emergency.	Chaptered 91-1186
AB 1967	Areias	Requires the Office of Emergency Services to develop evacuation guidelines for the University of California and the State University campuses to use in the development of emergency evacuation plans for student housing.	Chaptered 91-645
AB 2704	Speier	Requires the Office of Emergency Services to conduct a study to determine if there is a need for the expansion of existing local governmental emergency operation centers.	Vetoed
AB 2840	Woodruff	Requires the Office of Emergency Services to reimburse disaster search dog handlers for their travel costs to state training facilities.	Chaptered 90-894

Category 3—Emergency Management and Response (continued)

Bill No.	Author	Description	Status
AB 2962	Klehs	Requires the Office of Emergency Services and the Department of General Services to develop a model State Emergency Telecommuting Plan.	Vetoed
AB 2966	Polanco	Requires the Office of Emergency Services to work with advocacy groups for the hearing impaired to provide accessibility to emergency services information for these individuals through the public media.	Chaptered 90-725
AB 2994	Eaves	Requires high occupancy buildings and facilities to have an emergency public address system.	Chaptered 90-1426
AB 3568	Areias	Requires the Office of Emergency Services to establish a Natural Disaster Volunteer Corps Program.	Chaptered 90-536
AB 3876	Brown, W.	Establishes a statewide task force on Emergency Broadcast Systems.	Vetoed
AB 3894	Filante	Increases the jail time of a person convicted of looting during a declared state of emergency.	Chaptered 90-1126
ABx 5	Eastin	Requires the Metropolitan Transportation Commission to develop an Emergency Transportation Management Plan.	Chaptered 90-28x
SB 48	Thompson	Requires railroads corporations to pay a fee to the Public Utilities Commission for the cost of regulating the accidental spills of railroad cars.	Chaptered 91-766
SB 480	Greene, L.	Defines the term "emergency shelter" for the purposes of the Emergency Housing and Assistance Fund. In addition, the bill makes conforming changes in the 1989 Budget Act.	Chaptered 89-1346
SB 506	Green, C.	Makes funds in the Emergency Investigation Account available to the Seismic Safety Commission without regard to fiscal year.	Chaptered 89-621
SB 721	Rosenthal	Requires the Public Utilities Commission to order cellular telephone companies to provide access to emergency telephone services without charge.	Chaptered 91-273
SB 921	Vuich	Requires the California Highway Patrol to manage hazardous substance spills or disasters on state highways.	Chaptered 89-265
SB 946	Maddy	Requires interest earned on emergency medical services funds to be deposited to that fund for disbursement.	Chaptered 91-1169

Category 3—Emergency Management and Response (continued)

Bill No.	Author	Description	Status
SB 2058	Kopp	Requires the Office of Emergency Services to develop a digital emergency broadcast system.	Vetoed, 1990
SB 2778	Russell	Requires local government disaster councils to update and submit a copy of their disaster plans to the Office of Emergency Services.	Chaptered 90-488
SBx 46	Lockyer	Provides an immunity from liability for architects, engineers and building inspectors who evaluate structures following a natural disaster.	Chaptered 90-30x
SJR 9	Campbell, W.	Requests the President and Congress of the United States to direct federal agencies to help coordinate a Urban Search and Heavy Rescue Plan.	Chaptered 89-R-63

Category 4—Disaster Recovery

Bill No.	Author	Description	Status
AB 65	Tanner	Extends the date funds may be expended from the Disaster Response Emergency Investigation Account to June 30, 1992.	Chaptered 91-0034
AB 541	Farr	Requires each state agency to develop a disaster recovery plan for the information and computer technologies used by the agency.	Chaptered 90-1380
AB 1663	Hauser	Amends various sections of the Natural Disaster Assistance Housing Program administered by the Department of Housing and Community Development.	Chaptered 90-19
AB 1825	Areias	Establishes the Natural Disaster Victims Foreclosure Assistance Program within the Department of Housing and Community Development.	Vetoed
AB 2627	Moore	Requires insurers to clearly disclose deductibles for residential earthquake insurance.	Chaptered 90-1167
AB 2652	Tanner	Appropriates funds to the El Monte Unified School District for the repair of the high school gymnasium damaged by the October 1, 1987 Whittier Narrows Earthquake.	Vetoed, 1990

Category 4—Disaster Recovery (continued)

Bill No.	Author	Description	Status
AB 2811	Jones	Requires the Office of Statewide Health Planning and Development to submit a grant application to the the federal government on behalf of rural health care facilities.	Chaptered 90-755
AB 2837	Farr	Expands the authorization of the Natural Disaster Assistance Act to provide short-term loans.	Vetoed, 1990
AB 3263	Filante	Requires the Department of Housing and Community Development to develop and adopt emergency regulations for a Deferred Payment Rehabilitation Loan Program.	Chaptered 90-1509
AB 3291	Areias	Appropriates funds to the Natural Disaster Assistance Act to provide funds for the site preparation of temporary mobilehomes or manufactured housing.	Chaptered 90-1510
AB 3913	Areias	Creates a residential earthquake insurance program within the Department of Insurance.	Vetoed, 1990
AB 3637	Farr	Prohibits insurers from refusing a new policy of earthquake insurance.	Chaptered 90-1364
AB 4023	Cortese	Extends the 1986 Disaster Relief Program.	Chaptered 90-1197
ABx 16	Cortese	Requires the Office of Statewide Health Planning and Development to design a study identifying health care services which may be needed following a natural disaster.	Chaptered 90-34x
ABx 35	Cortese	Specifies that county offices of education, community college districts, and private nonprofit organizations are eligible for natural disaster assistance.	Chaptered 89-24x
ABx 36	Klehs	Appropriates $20 million in disaster relief.	Chaptered 89-15x
ABx 38	Sher	Creates the Earthquake Permit Review Panel to approve or deny appeals from the Department of Transportation projects exempted from the Environmental Quality Act.	Chaptered 89-17x
ABx 39	Seastrand	Appropriates $1,300,000 for the repair of state parks and historical resources damaged in the Loma Prieta earthquake.	Chaptered 89-8x
ABx 40	Farr	Requires the Department of Commerce to establish the California Earthquake Emergency Grant and Loan Program.	Chaptered 89-12x
ABx 41	Farr	Establishes the California Disaster Housing Rehabilitation Fund.	Chaptered 89-3x

Category 4—Disaster Recovery (continued)

Bill No.	Author	Description	Status
ABx 42	Vasconcellos	Amends the Natural Disaster Assistance Act to cover local government matching fund requirements for federal disaster relief programs.	Chaptered 89-1x
ABx 43	Vasconcellos	Allocates an additional $20,000,000 to the Special Fund for Economic Uncertainties.	Chaptered 89-19x
ABx 44	Hauser	Establishes the Natural Disaster Emergency Shelter Program within the Department of Commerce.	Chaptered 89-5x
ABx 45	Brown, W	Establishes uniform procedures for filing a claim against the State as a result of the collapse of the San Francisco Bay Bridge and the I-880 Cypress structure.	Chaptered 89-22x
ABx 48	Areias	Establishes the 1/4 cent sales and use tax to finance disaster repairs and recovery associated with the Loma Prieta earthquake.	Chaptered 89-13x
ABx 53	Elder	Allows the State Teachers Retirement Fund and the Public Employees Retirement Fund to make low interest loans to members whose homes were damaged by the Loma Prieta earthquake.	Chaptered 90-35x
AJR 64	Filante	A resolution to memorialize the President and Congress of the United States to carefully study and consider a residential earthquake insurance program.	Chaptered 90-R-86
AB 2566	Eastin	Requires the Office of the State Architect to establish a working group of state officials to develop a computer tracking system for state plan checking.	Vetoed
SB 125	Hill	Requires claims for payment against the California Earthquake Recovery (insurance) Fund to be made within 90 days of the earthquake.	Chaptered 91-0104
SB 196	Killea	Allows for the short-term financing of seismic repairs to transportation projects.	Chaptered 90-1328
SB 289	Green, C.	Extends the implementation date of the California Earthquake Recovery Fund from July 1, 1991, to January 1, 1992.	Chaptered 91-0081
SB 339	Green, C.	Requires insurers to reduce their premium on earthquake insurance if the insured dwelling is in accordance with the retrofit standards established in this bill.	Chaptered 91-0664

Category 4—Disaster Recovery (continued)

Bill No.	Author	Description	Status
SB 348	Robbins	Allows insurance companies to waive the coverage for living expenses on an earthquake insurance policy for non-owner-occupied dwellings.	Chaptered 91-0665
SB 412	Hill	Redefines the term "residential structures" to include multiple-unit structures for earthquake insurance Policy purposes.	Chaptered 91-0854
SB 439	Green, C	Allows the State Insurance Commissioner to establish a commercial earthquake insurance assistance program.	Vetoed, 1991
SB 480	Greene, L.	Defines the term "emergency shelter" for the purposes of the Emergency Housing and Assistance Fund. In addition, the bill makes conforming changes to the 1989 Budget Act.	Chaptered 89-1346
SB 505	Mello	Revises the state's matching fund requirements of the Natural Disaster Assistance Fund.	Vetoed, 1991
SB 640	Alquist	Transfers 1/4 cent Sales and Use Tax funds to the California Department of Transportation for the repair of highway bridges damaged in the Loma Prieta earthquake.	Chaptered 90-174
SB 995	Torres	Authorizes the Department of Housing and Community Development to use funds from the Emergency Housing Assistance Program to provide emergency shelters.	Chaptered 89-1329
SB 1631	Campbell, W.	Increases the grant limits of the Individual and Family Grants Program to $10,000.	Chaptered 89-1123
SB 1742	Greene, L.	Requires the Department of Transportation to inspect all bridges for needed seismic safety repairs by December 1, 1991.	Chaptered 90-1082
SB 1852	Ayala	Requires the Seismic Safety Commission, in cooperation with the County of San Bernardino, to develop a model disaster recovery plan.	Vetoed, 1990
SB 1881	Alquist	Requires the Seismic Safety Commission to study the economic impact of a major urban earthquake in California.	Vetoed, 1990
SB 1942	Lockyer	Transfers funds from the Special Fund for Economic Uncertainties to the San Francisco Bay Bridge and I-880 Cypress Structure Disaster Fund.	Chaptered 90-1669

Category 4—Disaster Recovery (continued)

Bill No.	Author	Description	Status
SB 2132	Mello	Provides for loan guarantees to small businesses damaged as a result of the Loma Prieta Earthquake.	Chaptered 90-1525
SB 2183	Robbins	Prohibits insurers from refusing a new policy of earthquake insurance.	Chaptered 90-1526
SB 2199	Robbins	Specifies that an insurer cannot limit liability from a fire which was caused by an earthquake.	Chaptered 90-326
SB 2428	Mello	Allows community facilities districts to finance needed seismic repair or retrofit of their buildings and facilities damaged by the Loma Prieta earthquake.	Vetoed, 1990
SB 2596	Robbins	Provides that no policy of residential insurance can be offered unless the insured is offered a policy of earthquake insurance.	Chaptered 90-1166
SB 2608	Green, C.	Requires the Insurance Commissioner to appoint an advisory committee on earthquake insurance.	Chaptered 90-1169
SB 2833	Ayala	Allows funds from the 1/4 cent Sales and Use Tax funds for the Loma Prieta Earthquake to be made available to persons whose property suffered damage in the Upland Earthquake of 1990.	Vetoed, 1990
SB 2902	Hill	Creates the California Residential Earthquake (insurance) Recovery Program within the Department of Insurance.	Chaptered 90-1165
SBx 1	Mello	Allows local governments to be eligible for Federal Emergency Management Agency disaster relief programs.	Chaptered 89-2x
SBx 3	Marks	Establishes the California Disaster Housing Rehabilitation Fund.	Chaptered 89-4x
SBx 4	Greene, L.	Establishes the Rural Emergency Assistance Housing and Infrastructure Program within the Department of Housing and Community Development.	Chaptered 89-6x
SBx 10	Morgan	Appropriates funds for the repair of parks and historical resources.	Chaptered 89-7x
SBx 11	Mello	Appropriates $19,400,000 to the Department of Social Services to augment costs associated with the Loma Prieta Earthquake.	Chaptered 89-9x
SBx 12	Mello	Establishes the California Earthquake Emergency Grants and Loan Guarantees Program.	Chaptered 89-11x

Category 4—Disaster Recovery (continued)

Bill No.	Author	Description	Status
SBx 12	Mello	Establishes the California Earthquake Emergency Grants and Loan Guarantees Program.	Chaptered 89-11x
SBx 14	Morgan	Recalculates the amount of school funding available as a result of the Loma Prieta earthquake.	Chaptered 90-25x
SBx 30	Mello	Establishes a procedure for the transmittal of local sales tax following the Loma Prieta Earthquake	Chaptered 90-37x
SBx 38	Petris	Redefines the term "local agency" to include county offices of education as well as community colleges to provide them with eligibility for natural disaster relief funding.	Chaptered 89-23x
SBx 33	Mello	Establishes the 1/4 cent sales and use tax to finance disaster repairs and recovery associated with the Loma Prieta earthquake.	Chaptered 89-14x
SBx 34	Garamendi	Allows persons to carry over losses associated with the Loma Prieta earthquake to subsequent tax years on their personal income taxes.	Chaptered 89-16x
SBx 36	Kopp	Exempts state and local highway reconstruction projects resulting from the Loma Prieta earthquake from the Environmental Quality Act.	Chaptered 89-18x
SBx 39	Mello	Imposes a recalculation of the property tax increment between the local jurisdictions and the redevelopment agencies of Santa Cruz and Watsonville.	Chaptered 90-26x
SBx 40	Campbell, W.	Allocates an additional $20,000,000 to the Special Fund for Economic Uncertainties.	Chaptered 89-20x
SBx 45	Lockyer	Provides funds for the San Francisco Bay Bridge and the I-880 Cypress Structure Disaster Fund.	Chaptered 89-21x
SBx 48	Mello	Appropriates $2,553,000 in earthquake repair funds to the Department of Commerce.	Chaptered 90-32x
SBx 49	Dills	Provides eligibility for private nonprofit organizations for disaster assistance under the Federal Emergency Management Act.	Chaptered 90-33x

Category 4—Disaster Recovery (continued)

Bill No.	Author	Description	Status
SCA 1	Garamendi	Adjusts the annual calculation of the appropriations limit to the state budget due to a disaster.	Chaptered 89-R-66
SJR 57	Green, C.	Requests the President and Congress of the United States to establish a National Earthquake Insurance Program.	Chaptered 90-R-127
SR 39	Kopp	A resolution to request the Department of Transportation and the Metropolitan Transit District to develop criteria for extended Ferry Service in the Bay Area.	Resolution Adopted

Category 5—Research and Information/Education

Bill No.	Author	Description	Status
AB 209	Cortese	Appropriates $481,000 to the Seismic Safety Commission from the Proposition 122 fund for the Commission's Proposition 122 Research Program.	Chaptered 91-0346
AB 429	Farr	Creates a Geographic and Land Information Systems task force to be convened by the Teale Data Center.	Chaptered 91-0782
AB 725	Hansen	Includes San Diego and Imperial Counties within the Southern California Earthquake Preparedness Project.	Chaptered 89-1056
AB 1873	Bentley	Requires all cities and counties to collect a building permit fee for the Strong Motion Instrumentation Program.	Chaptered 91-1096
AB 3551	Sher	Allows the California Department of Mines and Geology to borrow $350,000 from the Strong Motion Instrumentation Program to implement an environmental impact reporting program for mining operations.	Chaptered 90-1097
AB 3897	Brown, W.	Requires the Department of Mines and Geology to establish a Seismic Hazards Mapping Program in California.	Chaptered 90-1168
ABx 15	Cortese	Appropriates $140,000 to the Seismic Safety Commission to implement the first phase of the Proposition 122 Research Program.	Chaptered 90-31x
ACR 11	Katz	Establishes July as Earthquake Preparedness Month.	Chaptered 89-R-17

Category 5—Research and Information/Education (continued)

Bill No.	Author	Description	Status
AJR 63	Speier	Memorializes the FCC to develop guidelines for closed captioning of commercial television to provide information to the deaf and hearing impaired during a disaster.	Chaptered 90-R-81
AJR 65	Polanco	Memorializes the President and the Congress of the United States to require the FCC to develop guidelines for closed captioning of information on commercial television during a disaster for the deaf and hearing impaired.	Chaptered 90-R-138
SB 1245	Alquist	Provides funding for the Earthquake Research Evaluation Conference to be held by the Seismic Safety Commission, and funds up to five grants to commercialize new earthquake technologies through the Department of Commerce.	Chaptered 91-0901
SB 1835	Alquist	Requires the Seismic Safety Commission to develop an earthquake research plan for California and to sponsor an earthquake research evaluation conference.	Chaptered 90-782
SB 1906	Lockyer	Requires the California Division of Mines and Geology to develop a prototype hazardous earthquake fault monitoring facility on the Hayward Fault.	Vetoed, 1990
SB 2035	Hart	Includes Santa Barbara County within the Southern California Earthquake Preparedness Project.	Chaptered 90-474
SB 2247	Garamendi	Establishes a research and development grant program to be administered by the California Council on Science and Technology.	Vetoed, 1990
SB 2518	Craven	Requires the Department of Housing and Community Development to make a seismic safety study of mobilehome foundation systems.	Chaptered 90-615
SB 2553	Green, C.	Requires the Seismic Safety Commission to develop and publish the "Earthquake Hazard Reduction Guide" to be mailed out to homeowners at the renewal of their homeowners insurance policy.	Vetoed, 1990

Category 5—Research and Information/Education (continued)

Bill No.	Author	Description	Status
SB 2792	Nielsen	Appropriates $50,000 to California Division of Mines and Geology to perform a geologic hazard study of the Rogers Creek Fault.	Chaptered 90-1164
SR 53	Roberti	Encourages all Californians to participate in a duck, cover, and hold drill.	Chaptered_____ Resolution Adopted, 1990

Appendix D

California at Risk Commenters

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Brown, Susan, Chief, Contingency Planning, California Energy Commission

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Crawford, Dave, Professional Development, California Council, The American Institute of Architects

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Appendix E

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